

SHASTA-TRINITY NATIONAL FOREST
STREAM FISHERIES DATA STORAGE, RETRIEVAL
AND HABITAT ASSESSMENT PROGRAMS

March 20, 1981

Contacts: Paul Brouha, Forest Fisheries Biologist
Paul Renoud, Biological Technician

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STREAM FISHERIES DATA STORAGE, RETRIEVAL AND HABITAT ASSESSMENT PROGRAMS

I. Introduction

Shasta-Trinity National Forest stream fisheries data (as collected during general surveys) are stored on tape and disc (under storage and retrieval programs FISHIN and FISHLIST) in the Forest's PDP 11-70 computer, located at the Supervisor's Office in Redding, California. A habitat assessment program (FISHOUT) has been developed from these data which provides an index of habitat suitability (HSI) and computes area of habitat for four fish species groups.

II. Data Storage and Retrieval

The storage program (FISHIN) contains most of the quantitative data found in the Forest's stream surveys on file at the Supervisor's Office. (See Stream Survey Form, Appendix B, and Excerpt from FISHLIST (Retrieval Program), Appendix E). Data have been gathered within a stream reach format (See Amended R-5 Stream Survey Instructions, Appendix A) in which the set of data for each reach (stream section of variable length) represents an average of the conditions observed for each parameter throughout the reach. The stream reach is the basic coding unit for data storage and manipulation. (See Data Input Form, Appendix C and Coding Instructions for Data Input, Appendix C).

FISHIN provides for a simple data check in the form of an entry for statistical reliability of certain data according to a five-point system described in the coding instructions. This entry is made by the survey crew.

III. Development of the Habitat Assessment Program (FISHOUT)

FISHOUT is designed to provide a numerical index of habitat quality and amount of habitat (in acres) available, at present, for four fish species groups.

Stream parameters used in the evaluation of habitat quality include:

- Water depth, width and velocity
- Water temperature
- Percent shade or canopy
- Abundance of aquatic food organisms
- Pool-riffle ratio
- Stream channel stability
- Pool grade

Spawning site availability (based on substrate size) may be integrated into the equation when data become available.

Habitat quality in the form of a habitat suitability index (HSI) is computed with the following equation (developed by the US Fish and Wildlife Service):

$$HSI = [(P_1)^n (P_2)^n (P_3)^n \dots (P_x)^n]^{\frac{1}{N}}$$

where: P = Parameter Suitability Index (PSI)
 n = Parameter Weighting Factor
 N = $\sum n$

PSI's for each parameter are developed by comparing measured values to optimal values (see Appendix G). Parameter weighting factors reflect the relative significance of each parameter (see Appendix F).

HSI's are calculated by FISHOUT according to the general equation:

$$HSI = [(P_1)^{1.5} (P_2)^{1.5} (P_3)^{1.5} (P_4)^{.9} (P_5)^{.8} (P_6)^{.5} (P_7)^{.9} (P_8)^{.9} (P_9)^{.5}]^{\frac{1}{9.0}}$$

Where: P₁ = Water depth
 P₂ = Water width
 P₃ = Water velocity
 P₄ = Water temperature
 P₅ = Percent shade
 P₆ = Aquatic food organisms
 P₇ = Pool-riffle ratio
 P₈ = Channel stability
 P₉ = Pool grade

FISHOUT provides HSI's for each reach of a stream from mouth to headwaters, for each species group. Reaches not surveyed assume the value of the HSI of the adjacent lower reach or (if unavailable) the adjacent upper reach. Habitat quantity is calculated by multiplying average reach width by length.

In addition to HSI, FISHOUT provides reach and stream length, width, area, length from mouth to first barrier and unsurveyed length. In cases of missing data, the pertinent parameters are excluded from the HSI equation and listed (see Appendix H for example of program printout).

APPENDIX A - Amended R-5 Stream Instructions

Instructions for use of field form R5-2600-16

The collecting of field data by means of stream surveys is one of the most important activities carried out or supervised by the fishery manager. It is from this basic information that management plans are prepared. It also makes possible the important task of assessing the environmental impact of various proposed land and water uses. Data collected should be maintained in a separate file for each stream or lake. This file can then serve as a "life history" repository for all information gained pertaining to that particular body of water.

A stream survey for fisheries purposes is a system of collecting facts or judgments about a specific body of water and its related ecology in order to determine its role or comparative importance for production or utilization of fish resources. The main purposes served by the survey are as follows:

1. It is the basis of an inventory of the fish resources and habitat available.
2. It forms the basis for development of a fishery habitat management plan.
3. It permits the assessment of impacts of other land and water uses upon the fishery resource.
4. It forms the basis of functional input for fisheries in multiple use management.

Fisheries surveys to be useful must be prepared by persons possessing college level fisheries training. This is essential in order that they might know how to interpret what they observe as indices of favorable or unfavorable conditions.

The question of prime importance is: What kind of information should be collected? To what degree is detailed sampling necessary? Collection of information is of little value unless it can be put to beneficial use.

Surveys of waters may be divided into two categories:

General Surveys - To obtain general, broad information about a water which will permit its classification and indicate its general characteristics and management capabilities. This is a reconnaissance-type survey. Prior to going to the field the surveyor should compile all pertinent available data about the stream.

Special Surveys - To obtain data for a special purpose, such as optimum flow determinations or assessments of the impact of specific proposed uses upon the water. In this second case the data collected must be tailored to fit the specific objective. Detailed guidelines may eventually be formed for each type of special survey.

The present discussion is based upon determination of the minimum requirements necessary for the completion of a general survey. In collecting the required data it does not necessarily follow that a specific use or need exists for each type of information collected. Its collection is based primarily upon an appreciation of needs that have been observed to arise over a long period of time (5-10 years). On the other hand, data collection must be kept to a minimum mainly because of the limited time and manpower available for such functions.

The following is therefore an outline of that information considered essential for collection in the conduct of the normal General Survey:

STREAM SURVEYS - GENERAL

There is no substitute for covering a stream on foot throughout the entire length of those portions under study. Otherwise it is too easy to miss important features, such as falls, barriers, tributaries, etc., which must be known for a proper evaluation of the whole. The field survey forms, sketches, etc. should be completed in the field at the time of observations and retained in the original form as part of the permanent record. All data recorded is assumed to be factual as distinguished from estimates, which should be followed by "(est.)".

Large rivers over about 25 miles in length should be divided into three surveys: Upper, Middle, and Lower. The same type of information is collected separately for each reach in the course of traversing the area. This is followed by a summary of the stream characteristics as a whole.

It is best that stream surveyors work in pairs. This can often prove beneficial in saving time when auto access is possible at several points along the route of travel. "Leapfrogging" can be accomplished by one person driving ahead and leaving the car at a designated point to be picked up and moved forward by the other. For experienced stream surveyors it is possible for one person to conduct the work, but efficiency may be lowered and safety hazards increased.

EQUIPMENT NEEDED: Clipboard, survey forms, blank paper, topog. maps of area, plastic container with formaldehyde for preserving specimens, thermometer, timepiece, small hand seine, camera, a sharp eye and a stout pair of legs. A face mask and snorkel may also be useful.

RECORDING OF DATA: (See sample form attached)

The following data should be obtained:

1. Name of Stream - Record proper name first, followed by adjectives (Smith River, N. Fk.). You may also wish to include the stream identification number, as established by the USGS system.
2. River System - This is normally the name of the major river drainage. (Kings River, San Joaquin River)

3. Tributary to - Name the water that the stream being surveyed is directly tributary to.
4. Total Length - Length, in miles, of stream from mouth or lowermost point to headwaters. Do not include length of tributaries.
5. Stream Section - From lowermost point to uppermost point.
6. Location of Mouth or Lowermost Point - (Obtain information from map)
7. Description of Stream - On page 4 of the survey form or a separate full-sized blank sheet describe the stream characteristics whenever it changes in character or about every 1/4 mile as you are hiking along. On the same sheet or on an additional blank sheet make sketches of roads, trails, barriers, tributaries, etc. if not clearly shown on map.

REACH DATA

The following information is recorded for each reach of the stream or river surveyed. As each reach is completed, sit down and summarize the data while it is fresh in your mind. You may wish to make notes on page 4 while traversing the area in order to make it easier to define the average situation found throughout the section.

8. Location - Give Township, Range and Section of lowermost point in each stream reach.
9. Altitude - Give elevation range for entire reach. When possible, use altimeter and check against topog. map for verification.
10. Width - Give range (narrowest to widest width) and average width in feet.
11. Depth - Give range (shallowest to deepest) and average depth in feet to nearest tenth.
12. Flow - Estimate by the standard method of:

$$\frac{\text{Average Width X Average Depth X Distance}}{\text{Time in Seconds Float Travels Distance}} = \text{cfs}$$

It is not necessary to measure flows accurately with a flow meter for the general survey. Flow estimates can be satisfactorily made with a little practice. Test yourself occasionally by making your estimate of a measured flow. Example: If a stream has an average width of 15 feet, an average depth of 1-1/2 feet, paced distance along the stream is 50 feet, and a floating object requires 25 seconds to traverse the 50 feet, the estimate flow would be 45 cfs ($\frac{15 \times 1\frac{1}{2} \times 50}{25 \text{ sec.}} = \frac{1125}{25} = 45$ cubic feet per second (cfs)).

13. Velocity - Measure or estimate velocity and record as ft./sec. to the nearest tenth.

14. Air Temperature - Be sure the mercury bulb is dry. Take air temperature before water temperature. Stand in direct sun but hold thermometer in the shade of your body. Use Fahrenheit thermometer. Check its calibration for accuracy periodically.
15. Water Temperature - Take in flowing water rather than still water at margin.
16. Hour and Sky - Use 24 hour system (1600 = 4 p.m.). Record weather - Clear, overcast, raining, snowing.
17. Pools - Record pool, riffle, run ratio (P:R:R) for each reach. Give percentage of A, B, and C pools present (according to pool grade evaluation in Coding Instructions for Data Input, Appendix D) and record pool grade for each reach.
 - a. Size - Give range and average of pool diameter in feet.
 - b. Formed by - Rock falls, log barriers, increased flow near bank, etc.
 - c. Shelter - (Good, medium, poor) Shelter may consist of rocks with crevices, aquatic plants, or woody debris.
18. Riffles - See pools, above.
19. Bottom Type - Divide into the percent of each bottom type present. The total should be 100%. Record separately for pools and riffles.
 Types:
Bedrocks - Exposed rock mass in place.
Boulders - Large rocks over 5-6 feet diameter.
Rocks - 1-5 feet diameter.
Rubble - 2-12 inches diameter.
Gravel - 1/2-2 inch diameter.
Sand - About beach sand size.
Silt - Fine inorganic material.
Mud - Implies organic material present.
20. Shade Canopy - This is a measure of the water surface that is normally in shadow throughout most of the year and throughout the day. Consider canyon walls as well as vegetation. Record as percentage.
Formed by - (List the kind and size of trees providing most of the shade.)
21. Aquatic Vegetation - (Abundant, common, few, none seen) Name principal types (species where possible) and collect samples of common species not identifiable. Example: filamentous green algae, Nostoc, moss, diatoms, blue-greens, etc.
22. Aquatic Food Organisms - (Record organisms/ft.² seen for the following groups: Caddisflies, Mayflies, Stoneflies, Diptera, Beetles, Other

insects, Crustacea, and Others) Examine at least six different locations and record a composite of observations.

23. Overall Aquatic Foods - Organisms/ft.².

24. Fishes Present

a. All species combined - (Abundant, common, few)

b. Provide the following information for each species:

<u>Species</u>	<u>Average No. Per 100 ft. of Stream</u>	<u>Average Size</u>
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(Collect and preserve samples of any unidentified species.)
(Record in forked length - from tip of snout to fork of tail.)

25. Reproduction - (Based on observed abundance of immature fishes by individual species) - (Good, fair, poor, none seen)

26. Fish Predators

a. Birds - (Abundant, common, few) Number seen - (give actual number and species seen)

b. Snakes - (ditto)

27. Character of Watershed - (Use one or more of the following: Canyon, mountainous, hilly, rolling, flat, swampy, wooded, open, cultivated)

28. Soil Stability of Watershed - (Stable, moderate, unstable) This is based upon visual evidence of surface erosion and mass slides.

29. Stream Channel Stability - Rate channel stability for each stream using R-1 Stream Reach Inventory and channel stability evaluation form.

30. Present Condition of Streamflow - (High, average, low) Indicate also whether streamflow is perennial or intermittent.

31. Stream Gradient - Measure with clinometer and record as percentage.

32. Barriers - Give location, type and height. Also indicate whether or not it is impassable for fishlife by designating either as "complete" or "partial."

33. Diversions - Give name, location, type screened or unscreened, and estimated flow.

34. Springs - Give location, estimated flow, temperature.

35. Tributaries - Give location of mouth and estimated flow.

36. Water Quality -

- a. Turbidity - (High, medium, low) This is based on visual clarity of the water. Indicate depth in feet at which bottom is visible: High = less than 1 ft.; medium = 1-3 ft.; low = over 3 ft.
 - b. Nature and Origin of Turbidity - Describe whether caused by organic matter, colloidal suspension or heavy silt.
 - c. Other Pollution - (High, medium, low, none seen) If pollution is noted, give source, location, type, and extent.
37. Accessibility of Stream - (Good, fair, poor) Indicate by car or miles of trail. Consider all waters with road access if road is passable. Fair = up to 5 miles by trail unless extremely difficult; poor = over 5 miles by trail or no trail.
38. Fishing Use - (Light, medium, heavy, intense) Indicate estimated fisherman days (FD)* per year per acre of stream. Light = up to 10 FD per acre per year; medium = 11-99 FD; heavy = 100-200 FD; intense = over 200 FD.

SUMMARY - ENTIRE STREAM

39. Stream Classification - Classify based on general importance to fishlife: Class I Primary, Class II Secondary, Class III Tertiary, Class IV Limited or none. List each section if a different classification - (upper, middle, lower).

Class I - Perennial streams or segments thereof which meet any one of the following criteria, indicating a stream of primary importance:

- a. Are used by large numbers of fish for spawning, rearing or migration.
- b. Have high quality fish habitat.
- c. Have high angling use demands (even though fish habitat is marginal).
- d. Furnish water locally for domestic and/or municipal supplies, flow enough water to have major influence on downstream water quality.
- e. Are the major streams characterized by existing or anticipated fishing and/or water-oriented recreational uses.

Class II - Perennial or intermittent streams or segments thereof which meet any one of the following criteria, indicating a stream of secondary importance:

*A Fisherman Day equals one angler visit per day regardless of time. You should also estimate the average number of hours per angler visit.

- a. Are used by moderate though significant numbers of fish for spawning, rearing, or migration.
- b. Are used moderately for fishing and other recreational purposes.
- c. Flow enough water to have a moderate influence on downstream water quality.

Class III - These include perennial or intermittent streams or segments thereof which meet any one of the following criteria, indicating a stream of tertiary importance:

- a. Are used by only a few fish for spawning, rearing, or migration.
- b. Are used only occasionally for fishing or other recreational purposes.
- c. Flow only enough water to have minimum influence on downstream water quality.

Class IV - These are all other streams not previously classified stream condition and your appraisal of its importance.

- 40. Summary of Stream Characteristics and Remarks - Indicate overall stream condition and your appraisal of its importance.
- 41. Fish Stocking Program - Describe general type of stocking program conducted. If no data, write "Unknown." This information should be available from Department of Fish and Game records.
- 42. Management Recommendations - List what should be done to improve the stream habitat, fish resources, or their use. This is the most important entry.
- 43. Date of Survey - (If several days, so indicate)
- 44. Survey Made by - Indicate primarily the recorder but also other persons participating in the survey.

STREAM MANAGEMENT ANALYSIS INSTRUCTIONS

This portion of the stream form should be completed by the Forest Biologist either in the field or in the office upon return from the field trip. It consists of a summary of the conclusions reached from analysis of the survey data for a given stream. This is the most important element of the survey since it points out the kind of actions required to obtain maximum benefit from the fishery resources present.

The following numbers and instruction correspond to those items listed on the form:

- 1. Type of Fishery - Record either "Cold" for Coldwater Fishery, such as trout, salmon, or steelhead; "Warm" for Warmwater Fishery, such as bass,

bluegill, catfish, etc.; "Mixed" if a combination of both coldwater and warmwater fishes are present.

2. Primary Species - List by abbreviations or full names the fish species present in order of importance.
3. Overall Present Fishery Rating - List your overall assessment of the existing fishery in one of the following categories: Excellent, good, fair, poor.
 - a. Size of Stream - List according to average flow into one of the following categories: Large River - over 500 cfs; Small River - 100-499 cfs; Large Stream - 50-99 cfs; Medium Stream - 5-49 cfs; and Small Stream - less than 5 cfs.
 - b. Fishing Use - List on the basis of estimated angler use per acre per year using both of the following categories:

<u>Category</u>	<u>Fisherman Days Per Acre*</u>	<u>Recreation Days Per Acre**</u>
Intensive	Over 200	Over 50
Heavy	100-200	25-50
Medium	11-99	3-24
Light	0-10	0-2

*A Fisherman Day is one angler visit per day regardless of length of time spent.

**A Recreation Day is 12 hours of fishing use without regard to number of anglers.

- c. Other Uses - List other important uses made of the stream such as swimming, picnicking, boating, etc.
- d. Productivity - List as "High", "Medium", or "Low" based upon your estimate of stream production of living matter in relation to its size.
- e. Habitat Condition - List one of the following categories for overall condition:

"Excellent" - Habitat in natural state; little or no alteration by man; optimum fish habitat.

"Good" - Habitat in good conditions though evidence of alteration by man or nature present.

"Fair" - Habitat only in fair condition; some deterioration evident but still capable of supporting fishlife of the desired species.

"Poor" - Habitat obviously deteriorated by man or nature; not suitable for supporting fishlife in any quantity.

4. Improvement Potential - Select one of the following categories based on the anticipated improvement potential in relation to effort and funds expended:

"Excellent" - Spectacular results, high PR values.

"Good" - Measurable success anticipated, judged to be economically feasible.

"Fair" - Success not easily measurable, economic feasibility questionable.

"Poor" - Success poor or unpredicatble; not economically feasible.

5. Fish Management Recommendations - (These are recommended actions to be taken; if none are recommended in any of the following categories, write Not Recommended or NR. Otherwise indicate the management measure proposed. The following is simply a checklist of categories. It is not expected that recommendations will be proposed in each category.)
- a. Chemical Rehabilitation - Indicate whether total chemical rehabilitation and for which species; or selective chemical control for certain species reduction.
 - b. Fishery Regulations - List proposed actions not currently in effect such as change in: creel limits, size limits, gear restrictions, etc.
 - c. Regulation of Other Activities - List proposed actions not currently in effect such as change in: access control, boating control, water skiing control, zoning, etc.
 - d. Introduction of Exotic Fish Species - Include here suggested species for consideration. It is concluded that additional study and careful screening will be required.
 - e. Maintenance Stocking of Established Fish Species - Indicate whether you are recommending to continue present stocking program or initiating new action. Indicate species, size, numbers, stocking requirements, etc. if known.
 - f. Others - List any other management action proposed which does not fall in one of the above categories.
6. Habitat Management - (These are also recommended actions to be taken, if none write NF.)
- a. Watershed Management - List any activities deemed desirable and feasible for the general watershed outside the Stream Management Zone, such as erosion control, revegetation, etc.
 - b. Stream Management Zone (SMZ) Management - List any activities deemed desirable and feasible within the SMZ, such as erosion control, vegetation manipulation, etc.

- c. Water Quality Management - List needs for pollution or temperature control.
 - d. Physical Corrective Measures - List needs for water regulation, barrier removal, fish passage improvement, etc.
 - e. Others - List any other type of habitat management proposed.
- 7. Public Access and Land Acquisition - Include trail and road improvement needed as related to fish management.
 - 8. Public Use Facilities - Include campgrounds, toilets, parking areas, etc. needing improvements as related to fish management.

Additional Instructions

- 1. Rate reliability of measurements and observations according to reliability codes in Coding Instructions for Data Input, Appendix D.

USDA-FOREST SERVICE
REGION 3

STREAM SURVEY

FOREST	DISTRICT
1. NAME OF STREAM	2. RIVER SYSTEM
3. TRIBUTARY TO	4. TOTAL LENGTH
5. STREAM SECTION	
FROM:	TO:
6. LOCATION OF MOUTH OR LOWERMOST POINT	
TOWNSHIP	RANGE SECTION
7. DESCRIPTION OF STREAM: (USE PAGE 4 OR SEPARATE SHEET TO RECORD NOTES MADE DURING SURVEY).	

8. LOCATION	LOWER			MIDDLE			UPPER		
	TWP	RG	SEC	TWP	RG	SEC	TWP	RG	SEC
9. ALTITUDE RANGE	FT. TO FT.			FT. TO FT.			FT. TO FT.		
10. WIDTH OF STREAM	RANGE	FT. AVE	FT	RANGE	FT. AVE	FT	RANGE	FT. AVE	FT
11. DEPTH	RANGE	FT. AVE	FT	RANGE	FT. AVE	FT	RANGE	FT. AVE	FT
12. FLOW	c.f.s.			c.f.s.			c.f.s.		
13. VELOCITY									
14. AIR TEMPERATURE	°F			°F			°F		
15. WATER TEMPERATURE	°F			°F			°F		
16. HOUR AND SKY	HOUR	SKY		HOUR	SKY		HOUR	SKY	
17. POOLS-ABUNDANCE									
a. Size (diameter)	RANGE	FT. AVE	FT	RANGE	FT. AVE	FT	RANGE	FT. AVE	FT
b. Formed by									
c. Shelter									
18. RIFFLES-ABUNDANCE									
19. BOTTOM TYPE	Bedrock	Boulders	Rocks	Rubble	Gravel	Sand	Silt	Mud	
a. Pools									
b. Riffles									
20. SHADE CANOPY									
a. Species									
21. AQUATIC VEGETATION									
a. Species									
22. AQUATIC FOOD ORGANISMS									
a. Caddisflies									
b. Mayflies									
c. Stoneflies									
d. Diptera									
e. Beetles									
f. Other Insects									
g. Crustacea									
h. Others									
23. OVERALL AQUATIC FOODS									
24. FISHES PRESENT									
a. All Species Combined									
b. Species 1									
(1) Abundance									
(2) Ave. No. per 100 ft.									
(3) Length Range	INCHES			INCHES			INCHES		
(4) Ave. Length	INCHES			INCHES			INCHES		

c. Species 2	LOWER	MIDDLE	UPPER
(1) Abundance			
(2) Ave. No. per 100 ft.			
(3) Length range			
(4) Ave. length			
d. Species 3			
(1) Abundance			
(2) Ave. No. per 100 ft.			
(3) Length range			
(4) Ave. length			
e. Species 4			
(1) Abundance			
(2) Ave. No. per 100 ft.			
(3) Length range			
(4) Ave. length			
25. REPRODUCTION			
a. Species 1			
b. Species 2			
c. Species 3			
d. Species 4			
26. FISH PREDATORS			
a. Birds			
b. Snakes			
27. CHARACTER OF WATERSHED			
28. WATERSHED SOIL STABILITY			
29. STREAM CHANNEL STABILITY			
30. STREAM FLOW CONDITION			
31. STREAM GRADIENT			
32. BARRIERS			
33. DIVERSIONS			
34. SPRINGS			
35. TRIBUTARIES			
36. WATER QUALITY			
a. Turbidity			
b. Nature of Turbidity			
c. Other Pollution			
37. ACCESSIBILITY			
a. Car or Trail			
38. FISHING USE			
a. Est. Fisherman days	Per Year	Per Year	Per Year
b. Est. ave. hours fished per day			

SUMMARY-ENTIRE STREAM

39. STREAM CLASSIFICATION:	LOWER	MIDDLE	UPPER
REMARKS:			
40. STREAM CHARACTERISTICS AND REMARKS			
41. FISH STOCKING PROGRAM			
42. MANAGEMENT RECOMMENDATIONS:			
42. DATE OF SURVEY		43. SURVEY MADE BY	

STREAM MANAGEMENT ANALYSIS-(May be filled out at Office)		
1. TYPE OF FISHERY		2. PRIMARY SPECIES
3. OVERALL PRESENT FISHERY RATING	a. Size of Stream	b. Fishing Use
c. Other Uses	d. Productivity	e. Habitat Condition
4. IMPROVEMENT POTENTIAL		
5. FISH MANAGEMENT RECOMMENDATIONS:		
a. Chemical Rehabilitation		
b. Fishery Regulation		
c. Regulation of Other Activities		
d. Introduction of Exotic Fish Species		
e. Maintenance Stocking of Established Fish Species		
f. Others		
6. HABITAT MANAGEMENT:		
a. Watershed Management		
b. Stream Protection Belt Management		
c. Water Quality Management		
d. Physical Corrective Measures		
e. Others		
7. PUBLIC ACCESS AND LAND AQUISITION		
8. PUBLIC USE FACILITIES		

SPACE FOR SKETCH MAPS OR ADDITIONAL REMARKS

REACH LOCATION: Survey Date _____ Time _____ Obs. _____

Forest _____ Rgr. Dist. _____

Stream _____ P.W.I. _____

Other Identification _____ V/S No. _____

Reach Description & Other Identification

Key #	Stability Indicators by Classes (Fair and Poor on reverse side)			
	EXCELLENT		GOOD	
1	Bank slope gradient < 30%.	(2)	Bank slope gradient 30-40%.	(4)
2	No evidence of past or any potential for future mass wasting into channel.	(3)	Infrequent and/or very small. Mostly healed over. Low future potential.	(6)
3	Essentially absent from immediate channel area.	(2)	Present but mostly small twigs and limbs.	(4)
4	50%+ plant density. Vigor and variety suggests a deep, dense, soil binding, root mass.	(3)	70-90% density. Fewer plant species or lower vigor suggests a less dense or deep root mass.	(6)
5	Adequate for present plus some increases. Peak flows contained. W/D ratio < 7.	(1)	Adequate. Overbank flows rare. Width to Depth (W/D) ratio 8 to 15.	(2)
6	60%+ with large, angular boulders 12"+ numerous.	(2)	40 to 60%, mostly small boulders to cobbles 6-12".	(4)
7	Rocks and old logs firmly embedded. Flow pattern without cutting or deposition. Pools and riffles stable.	(2)	Some present, causing erosive cross currents and minor pool filling. Obstructions and deflectors newer and less firm.	(4)
8	Little or none evident. Infrequent raw banks less than 6" high generally.	(4)	Some, intermittently at outcrops and constrictions. Raw banks may be up to 12".	(8)
9	Little or no enlargement of channel or point bars.	(4)	Some new increase in bar formation, mostly from coarse gravels.	(8)
10	Sharp edges and corners, plane surfaces roughened.	(1)	Rounded corners and edges, surfaces smooth and flat.	(2)
11	Surfaces dull, darkened, or stained, Gen. not "bright".	(1)	Mostly dull, but may have up to 75% bright surfaces.	(2)
12	Assorted sizes tightly packed and/or overlapping.	(2)	Moderately packed with some overlapping.	(4)
13	No change in sizes evident. Stable materials 80-100%.	(4)	Distribution shift slight. Stable materials 50-80%.	(8)
14	Less than 5% of the bottom affected by scouring and deposition.	(6)	5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	(12)
15	Abundant. Growth largely moss-like, dark green, perennial. In swift water too.	(1)	Common. Algal forms in low velocity & pool areas. Moss here too and swifter waters.	(2)

EXCELLENT COLUMN TOTAL →

GOOD COLUMN TOTAL →

Add values in each column and record in spaces below. Add column scores.

E. + G. + F. + P. = Total Reach Score.

Adjective ratings: E=Excellent, 39-76=Good, 77-114=Fair, 115+-Poor*

*(Scores above may be locally adjusted by Forest Hydrologist)

SI-P-200-12 Rev. 1-75 Side 1.

Stream Width _____ ft. X Ave. Depth _____ ft. X Ave. Velocity _____ f/s = Flow cfs
 Reach _____ Stream Turbidity _____ Stream Sinuosity _____
 Gradient _____, Order _____, Level _____, Stage _____, Ratio _____
 Temperature _____ Air _____ Water _____, Others _____
 9° or C off:

Key #	Stability Indicators by Classes			
	FAIR		POOR	
1	Bank slope gradient 40-60%.	(6)	Bank slope gradient 60%+.	(8)
2	Moderate frequency & size, with some raw spots eroded by water during high flows.	(9)	Frequent or large, causing sediment nearly yearlong OR imminent danger of canal.	(12)
3	Present, volume and size are both increasing.	(6)	Moderate to heavy amounts, predominantly larger sizes.	(8)
4	50-70% density. Lower vigor and still fewer species form a somewhat shallow and discontinuous root mass.	(9)	< 50% density plus fewer species & less vigor indicate poor, discontinuous, and shallow root mass.	(12)
5	Barely contains present peaks. Occasional overbank floods. W/D ratio 15 to 25.	(3)	Inadequate. Overbank flows common. W/D ratio > 25.	(4)
6	20 to 40%, with most in the 3-6" diameter class.	(6)	< 20% rock fragments of gravel sizes, 1-3" or less.	(8)
7	Moderately frequent, moderately unstable obstructions & deflectors move with high water causing bank cutting and filling of pools.	(6)	Frequent obstructions and deflectors cause bank erosion yearlong. Sediment traps full, channel migration occurring.	(8)
8	Significant. Cuts 12"-24" high. Root mat overhangs and sloughing evident.	(12)	Almost continuous cuts, some over 24" high. Failure of overhang frequent.	(16)
9	Moderate deposition of new gravel & coarse sand on old and new bars.	(12)	Extensive deposits of predominantly fine particles. Accelerated bar development.	(16)
10	Corners & edges well rounded in two dimensions.	(3)	Well rounded in all dimensions, surfaces smooth.	(4)
11	Mixture, 50-50% dull and bright, ± 1% ie. 75-65%.	(3)	Predominantly bright, 65%+, exposed or scoured surfaces.	(4)
12	Mostly a loose assortment with no apparent overlap.	(6)	No packing evident. Loose assortment, easily moved.	(8)
13	Moderate change in sizes. Stable materials 20-50%.	(12)	Marked distribution change. Stable materials 0-20%.	(16)
14	30-50% affected. Deposits & scour at obstructions, constrictions, and bends. Some filling of pools.	(18)	More than 50% of the bottom in a state of flux or change nearly yearlong.	(24)
15	Present but spotty, mostly in backwater areas. Seasonal blooms make rocks slick.	(3)	Perennial types scarce or absent. Yellow-green, short term blooms may be present.	(4)

FAIR COLUMN TOTAL →

POOR COLUMN TOTAL →

Size Composition of Bottom Materials (Total to 100%)

- | | | | |
|--------------------------------|---|--------------------------------|---|
| 1. Exposed bedrock..... | 7 | 5. Small rubble, 3"-6"..... | 7 |
| 2. Large boulders, 3'+ Dia.... | 7 | 6. Coarse gravel, 1"-3"..... | 7 |
| 3. Small boulders, 1-3'..... | 7 | 7. Fine gravel, 0.1-1"..... | 7 |
| 4. Large rubble, 6"-12"..... | 7 | 8. Sand, silt, clay, muck..... | 7 |

KEY NUMBER ON FIELD CARDS

Upper Banks

Lower Banks

Bottom

Item Rated	
Landform Slope	1
Mass Wasting or Failure (existing or potential)	2
Debris Jam Potential (Floatable Objects)	3
Vegetative Bank Protection	4
Channel Capacity	5
Bank Rock Content	6
Obstructions Flow Deflectors Sediment Traps	7
Cutting	8
Deposition	9
Rock Angularity	10
Brightness	11
Consolidation or Particle Packing	12
Bottom Size Distribution and Percent Stable Materials	13
Scouring and Deposition	14
Clinging Aquatic Vegetation (Moss and Algae)	15

Valley
X-SectionChannel
X-Section

Remarks

2. STREAM - NAME

3. STREAM - MOUTH - LOC

32. STREAM LENGTH (MI)

4. REACH - NO

5. LOW - REACH - BD (MI)

51. REACH - LENGTH

6. SURVEY DATE

PROP - POOLS, RUNS, RIFF (%)

PROP - POOLS, RUNS, RIFF (F,C,A)

POOL: BOTTOM TYPES (%)

RIFLE: BOTTOM TYPES (%)

116. BEDROCK	516. GRAVEL							
216. BOULDERS	616. SAND							
316. ROCKS	716. SILT, MUD							
416. RUBBLE								
17. RELIAB - 116 - 716								

REACH - NO

15. POOL GRADE

18. WATER - TEMP

180. RELIAB - 18

181. STREAM - GRADIENT

AQUA FOOD ORGANISMS

19. AQUA - FOOD - ORG(FT)

20. AQUA - FOOD - ORG(F,C,A)

21. RELIAB - 19 - 20

22. STREAM - SHADED - %

250. LIMITING - FACTOR(S)

CHANNEL STABILITY

23. SRI

24. SCS

STAND - CROP - FISH

125. SPECIES CODE

225. NOS/100 - FT

325. ABUNDANCE

425. RELIAB - 125 - 325

125.

225.

325.

425.

APPENDIX D - Coding Instructions for Data Input

Item No. - Input Item

2. STREAM-NAME - Enter stream name as follows:

Rivers - North Fork Trinity River, code as NF TRINITY
 Streams - Rush Creek, code as RUSH C
 Tributary to Rush Creek, code as RUSH C TI, T2, etc.
 Raspberry Gulch, code as RASPBERRY G
 Devils Canyon, code as DEVILS CN
 Unnamed Stream 21-13, code as CR 21-13.
 (NAME X [14])

3. STREAM-MOUTH-LOC - Enter the Township, Range and Section of the stream mouth. (Example: T. 3 N., R. 6 E., Sec. 3, code as 03N06E03).
 (NAME X [8])

32. STREAM-LENGH (MI) - Stream length is generally given in the survey. Measure length from origin to mouth on USGS Quadrangle Base maps with the use of a mileage wheel, as a check. Use measured length if the lengths differ. Enter length to the nearest tenth mile.
 (DECIMAL 99.9)

4. REACH-NO - Assign reach numbers in ascending order proceeding upstream, from mouth to source. Enter 1 or 2 digit number directly.
 (INTEGER 9)

5. LOW-REACH-BD (MI) - Enter distance from mouth in miles.
 (NAME X [12])

51. REACH-LENGTH - Measure reach length on USGS Quadrangle Base map with mileage wheel to the nearest tenth mile and code directly. Surveyed reach lengths for a stream will equal stream length (Item 32).
 (DECIMAL 9.9)

6. SURVEY-DATE - Enter survey date as 6 digits (090773).
 (INTEGER 999999)

7. AVE-DEPTH - Code directly from survey to the nearest tenth foot. Should the survey give separate values for pool depth and riffle depth, weight the values according to the proportion of each within the reach (if proportions are given).
 (DECIMAL 99.9)

8. AVE-WETTED-WIDTH - Code directly from survey to the nearest foot.
 (INTEGER 99)

9. VELOCITY - Velocity of flow. Enter as foot per second flow, to the nearest tenth foot.
 (DECIMAL 9.9)

10. RELIAB-7-9 - Rate the reliability of the data for Items 7, 8, and 9 according to the following rating structure.
(INTEGER 9)

RELIABILITY

Code

- 1 Data based primarily on simple observations, comparisons, and/or heuristics.
 - 2 Data based on projections from nonstistically controlled measurements on other populations with similar conditions.
 - 3 Data based on nonstatistical measurements (other than observations, comparisons, and heuristics).
 - 4 Data based on a combination of statistical and nonstatistical methods of measurement.
 - 5 Data based on statistical methods of measurement.
- A lack of knowledge of methods used by stream surveyors to collect certain data may require the use of a conservative rating.
111. PROP-POOLS-% - Proportion of pools within the reach. Code proportion of pools, runs and riffles to the nearest percent and enter number. Data is generally unavailable for runs but assign a value which will bring the total (pools, runs and riffles) to 100% (for example: pool = 67, riffles = 33, runs = 0) and rate reliability accordingly.
(INTEGER 999)
211. PROP-RUNS-% - Proportion of runs within the reach. Code to the nearest percent.
(INTEGER 999)
311. PROP-RIFFLES-% - Proportion of riffles within the reach. Code to the nearest percent.
(INTEGER 999)
112. PROP-POOLS (F, C, A) - Proportion of pools within the reach. Pools and riffles have been evaluated as "abundant, common or few" for most streams surveyed.
- Code pools, runs and riffles as A, C, or F (abundant, common, or few). Items 112, 212, 312 duplicate Items 111, 211, 311. Code data for Items 111-311 or 112-312 (depending on survey data available for this parameter), but not both.
(NAME X)
212. PROP-RUNS (F, C, A) - Proportion of runs within the reach. Code as A, C, or F.
(NAME X)

312. PROP-RIFFLES (F, C, A) - Proportion of riffles within the reach. Code as A, C, or F.
(NAME X)
13. RELIAB-111-312 - Rate the reliability of data for Items 111 through 312.
(INTEGER 9)
114. POOL-BEDROCK-% - Percentage of bedrock composing the bottom type of pools within the reach. Evaluated according to the following criteria for bottom type.
(INTEGER 999)

Bottom Type - Divide into the percent of each bottom type present. The total should be 100%.

Types:

Bedrock - Exposed rock mass in place.

Boulders - Large rocks over 5-6 feet diameter.

Rocks - 1-5 feet diameter.

Rubble - 2-12 inches diameter.

Gravel - 1/4-2 inch diameter.

Sand - About beach and size.

Silt - Fine inorganic material.

Mud - Implies organic material present.

Enter Percentage. If bedrock not represented in the reach, enter zero.

214. POOL-BOULDER-% - Percentage of boulders composing the bottom type of pools, within the reach. Enter percentage.
(INTEGER 999)
314. POOL-ROCKS-% - Percentage of rocks composing the bottom type of pools within the reach. Enter percentage.
(INTEGER 999)
414. POOL-RUBBLE-% - Percentage of rubble composing the bottom type of pools within the reach. Enter percentage.
(INTEGER 999)
514. POOL-GRAVEL-% - Percentage of gravel composing the bottom type of pools within the reach. Enter percentage.
(INTEGER 999)
614. POOL-SAND-% - Percentage of sand composing the bottom type of pools within the reach. Enter percentage.
(INTEGER 999)
714. POOL-SILT-MUD-% - Percentage of silt and mud composing the bottom type of pools within the reach. Enter percentage.
(INTEGER 999)

116. RIFF-BEDROCK-% - Percentage of bedrock composing the bottom type of riffles within the reach. Refer to Item 14 for size classes. Enter percentage.
(INTEGER 999)
216. RIFF-BOULDERS-% - Percentage of boulders composing the bottom type of riffles within the reach. Enter percentage.
(INTEGER 999)
316. RIFF-ROCKS-% - Percentage of rocks composing the bottom type of riffles within the reach. Enter percentage.
(INTEGER 999)
416. RIFF-RUBBLE-% - Percentage of rubble composing the bottom type of riffles within the reach within the reach. Enter percentage.
(INTEGER 999)
516. RIFF-GRAVEL-% - Percentage of gravel composing the bottom type of riffles within the reach within the reach. Enter percentage.
(INTEGER 999)
616. RIFF-SAND-% - Percentage of sand composing the bottom type of riffles within the reach within the reach. Enter percentage.
(INTEGER 999)
716. RIFF-SILT-MUD-% - Percentage of silt and mud composing the bottom type of riffles within the reach within the reach. Enter percentage.
(INTEGER 999)
17. RELIAB-114-716 - Rate the reliability of data for Items 114 through 716.
(INTEGER 9)
15. POOL-GRADE - Evaluation of pools within the reach by depth and submerged cover. Code as A, B, or C according to the following instruction.
(NAME X)

Code

- A Deep (3'-6'+) pools with excellent underwater cover in the form of submerged boulders, logs or other debris or with undercut banks. If a reach has 50 percent or more of its length in this type of pool, it may be classed as an "A" reach.
- B Shallow (6"-3') pools with good submerged cover. If a reach has 20-50 percent of its length in this type of pool, it may be classed as a "B" reach.
- C Shallow (6") pools with no submerged cover or reach with very few "A" and "B" pools.

If a reach has long stretches of continuous deep, slow moving water, it may be classed as "B".

If a reach or drainage ditch has no pools and is shallow, it should be classed as "C".

18. WATER-TEMP - Water temperature (degrees Fahrenheit), to the nearest degree. Enter directly from survey.
(INTEGER 99)
180. RELIAB-18 - Rate the reliability of data for Item 18.
(INTEGER 9)
19. AQUA-FOOD-ORG (FT) - Numbers of aquatic food organisms per square foot within the reach. Enter number directly from survey.
(INTEGER 999)
20. AQUA-FOOD-ORG (F, C, A) - Abundance of aquatic food organisms within the reach. Code as A, C, or F (abundant, common, or few). Item 20 duplicates Item 19. Enter data for one or the other.
(NAME X)
21. RELIAB-19-20 - Rate the reliability of data for Items 19 and 20.
(INTEGER 9)
22. STREAM-SHADED-% - Canopy density for the reach. If percentage shade canopy is given in the survey, enter the value (to the nearest percent). If shade canopy is described as dense, code as 50%; if described as medium, code as 30%; if light, code as 5%.
(INTEGER 999)
23. SRI - Channel stability evaluation rating for the reach. This rating system was incorporated into fisheries stream survey procedures during the 1978 field season. Channel stability evaluation ratings for selected other Forest streams available from the Hydrology Branch of the Shasta-Trinity National Forest, SO. Enter number.
(INTEGER 999)
24. SCS - Stream channel stability evaluation for the reach. Rated as stable, moderate or unstable. This item duplicates Item 23. Use only when data for Item 23 are not available. Code as VU, VS, U, S, or M (very unstable, very stable, unstable, stable, or moderate).
(NAME XX)
250. LIMITING FACTOR(S) - Factors which prevent the stream from attaining its full capability for fish production. Code according to the following instructions.
(NAME X)

LIMITING FACTORS ON STREAM CAPABILITY

Indicate one or more factors which prevent the stream from attaining its full capability for fish production.

Code	Limiting Factors
------	------------------

<u>C</u>	Insufficient cover.
<u>W</u>	Water use appropriated for non-fishery purposes.
<u>B</u>	Stream barriers.
<u>S</u>	Excess sedimentation.
<u>P</u>	Water and/or air pollution.
<u>1</u>	Water use + stream barrier.
<u>2</u>	Water use + stream barrier + sedimentation.
<u>3</u>	Water use + stream barrier + sedimentation + pollution.
<u>4</u>	Water use + sedimentation.
<u>5</u>	Water use + sedimentation + pollution.
<u>6</u>	Water use + pollution.
<u>7</u>	Stream barrier + sedimentation.
<u>8</u>	Stream barrier + sedimentation + pollution.
<u>9</u>	Stream barrier + pollution.
<u>0</u>	Sedimentation + pollution.

25. STAND-CROP-FISH - Standing crop of fish within the reach. Items 125, 225, 325, and 425 refer to standing crop.
125. SPECIES-CODE - Species code for fish present in the reach. Enter 2- or 3- letter species code directly (See California Department of Fish and Game species codes). Code each species separately.
(NAME XXX)
225. NOS/100-FT - Numbers of fish (of a species) within a 100 foot section of the reach. Enter number of fish directly.
(INTEGER 99)
325. ABUNDANCE (F, C, A) - Relative abundance of a species within the reach. Rated as F, C, or A (few, common, or abundant) in accordance with survey instructions. Code as F, C, or A. This item duplicates Item 225. Use only when data for Item 225 are unavailable.
(NAME X)
425. RELIAB-125-325 - Rate reliability of Items 125, 225, and 325.
(INTEGER 9)

FISH SPECIES CODES
(Adapted from CDF&G Species Codes)

Code

<u>UNK</u>	Unknown Species
<u>LP</u>	Lamprey
<u>WST</u>	White sturgeon
<u>GST</u>	Green sturgeon
<u>AS</u>	American shad
<u>TFS</u>	Threadfin shad
<u>WF</u>	Mountain whitefish
	Salmon
<u>PS</u>	Pink salmon
<u>CS</u>	Chum salmon
<u>SS</u>	Silver salmon
<u>KS</u>	King salmon
<u>RS</u>	Sockeye salmon
<u>KOK</u>	Kokanee salmon
	Trout
<u>BN</u>	Brown trout
<u>CT</u>	Cutthroat trout
<u>CTC</u>	Coast cutthroat trout
<u>CTL</u>	Lahontan cutthroat trout
<u>CTP</u>	Piute cutthroat trout
<u>RT</u>	Rainbow trout
<u>SH</u>	Steelhead rainbow trout
<u>RTK</u>	Kamloops rainbow trout
<u>RTH</u>	Hot Creek stock
<u>RTS</u>	Mt. Shasta stock
<u>RTW</u>	Mt. Whitney stock
<u>ELT</u>	Eagle Lake trout
<u>GT</u>	Golden trout
<u>RB</u>	Redband trout
	Charrs
<u>DV</u>	Dolly Varden trout
<u>EB</u>	Eastern brook trout
<u>LT</u>	Lake trout
<u>AG</u>	Artic grayling
<u>SKR</u>	Suckers
	Minnows
<u>CP</u>	Carp
<u>GF</u>	Goldfish
<u>GSH</u>	Golden shiner
<u>GB</u>	Sacramento blackfish
<u>HH</u>	Hardhead
<u>HCH</u>	Hitch
<u>SQ</u>	Squawfish
<u>LRS</u>	Lahontan redbside
<u>RCH</u>	Roach
<u>TC</u>	Tui chub
<u>DC</u>	Dace
<u>PRS</u>	Red shiner
<u>FHM</u>	Fathead minnow

Catfish

<u>CCF</u>	Channel catfish
<u>WCF</u>	White catfish
<u>BCF</u>	Blue catfish
<u>FCF</u>	Flathead catfish
<u>BB</u>	Brown bullhead
<u>BLB</u>	Black bullhead
<u>YB</u>	Yellow bullhead
<u>GAM</u>	Mosquitofish
<u>SB</u>	Striped bass
<u>YP</u>	Yellow perch
<u>REB</u>	Redeye bass
<u>SMB</u>	Smallmouth bass
<u>SPB</u>	Spotted bass
<u>LMB</u>	Largemouth bass
<u>WB</u>	Warmouth bass
<u>GSF</u>	Green sunfish
<u>PSD</u>	Pumpkinseed
<u>BG</u>	Bluegill
<u>WCR</u>	White crappie
<u>BCR</u>	Black crappie
<u>SP</u>	Sacramento perch
<u>TP</u>	Tule perch
<u>SCP</u>	Sculpin
<u>STB</u>	Stickleback
<u>MUL</u>	Striped mullet
<u>PUP</u>	Pupfish
<u>BAR</u>	Bairdiella
<u>SAR</u>	Sargo
<u>ORC</u>	Orangemouth corvina
<u>JS</u>	Juvenile salmonids
<u>RT-SH</u>	Rainbow/Steelhead (Rainbow or Steelhead)
<u>RT-RB</u>	Rainbow/Redband (Rainbow or Redband)

APPENDIX E - Excerpt From FISHLIST (Retrieval Program)

```

3  MAPLE C          2 00/00/00

CARD  *2*STREAM NAME *4*  *6*  *15* /*17* *18* *180* *181* *19* *20* *21* *22* *23* *24* *250*
4  MAPLE C          2 00/00/00

*****
CARD  *2*STREAM NAME *1*STREAM CODE *3*MOUTH *32*LENGTH
1  CONNER C          34N11W36  4.6

CARD  *2*STREAM NAME *4*  *6*  *51*  *61*  *62*  *7*  *8*  *9*  *10*  *11*  *211*  *311*  *112*  *212*  *312*  *13*
2  CONNER C          1 05/15/80  1.4  0.0  *62*  .9  15  1.5  2  20  0  80  *112*  *212*  *312*  2

CARD  *2*STREAM NAME *4*  *6*  *114*  *214*  *314*  *414*  *514*  *614*  *714*  *116*  *216*  *316*  *416*  *516*  *616*  *716*
3  CONNER C          1 05/15/80  0  0  10  40  45  5  0  0  2  15  60  23  0  0

CARD  *2*STREAM NAME *4*  *6*  *15*  *17*  *18*  *180*  *181*  *19*  *20*  *21*  *22*  *23*  *24*  *250*
4  CONNER C          1 05/15/80  C  2  52  4  6.00  19  2  60  112  -  1

CARD  *2*STREAM NAME *4*  *6*  *125*  *225*  *325*  *425*
5  CONNER C          1 05/15/80  SH  30.00  -  2

CARD  *2*STREAM NAME *4*  *6*  *51*  *61*  *62*  *7*  *8*  *9*  *10*  *11*  *211*  *311*  *112*  *212*  *312*  *13*
2  CONNER C          2 05/15/80  1.7  0.0  *62*  .8  15  2.5  2  20  0  80  *112*  *212*  *312*  2

CARD  *2*STREAM NAME *4*  *6*  *114*  *214*  *314*  *414*  *514*  *614*  *714*  *116*  *216*  *316*  *416*  *516*  *616*  *716*
3  CONNER C          2 05/15/80  0  5  10  25  50  10  0  0  5  25  50  20  0  0

CARD  *2*STREAM NAME *4*  *6*  *15*  *17*  *18*  *180*  *181*  *19*  *20*  *21*  *22*  *23*  *24*  *250*
4  CONNER C          2 05/15/80  C  2  46  4  13.00  10  2  80  65  -  1

CARD  *2*STREAM NAME *4*  *6*  *125*  *225*  *325*  *425*
5  CONNER C          2 05/15/80  0  .00  -  2

CARD  *2*STREAM NAME *4*  *6*  *51*  *61*  *62*  *7*  *8*  *9*  *10*  *11*  *211*  *311*  *112*  *212*  *312*  *13*
2  CONNER C          3 00/00/00  1.5

CARD  *2*STREAM NAME *4*  *6*  *114*  *214*  *314*  *414*  *514*  *614*  *714*  *116*  *216*  *316*  *416*  *516*  *616*  *716*
3  CONNER C          3 00/00/00

CARD  *2*STREAM NAME *4*  *6*  *15*  *17*  *18*  *180*  *181*  *19*  *20*  *21*  *22*  *23*  *24*  *250*
4  CONNER C          3 00/00/00

*****
CARD  *2*STREAM NAME *1*STREAM CODE *3*MOUTH *32*LENGTH
1  BUTTER C T3          02N07E02  2.3

```

APPENDIX F - Parameter Weighting Factors

Stream parameters are evaluated against the following biological assessment categories:

1. Significance to Fish Life - Relates habitat parameters to basic environmental needs of anadromous and resident cold water species. Does the parameter meet a survival (3), reproductive (2), or population maintenance (1) requirement?
2. Limiting Factor - Identifies the importance of each parameter as a possible limiting factor to fish production. Is the parameter subject to little or no compensation by other factors (2), or to some compensation (0)?
3. Influence of Change - Indicates whether each parameter affects the entire stream (3), a portion (1) or a localized site only (.5).
4. Other Factors Affected by Change - Shows whether each parameter is affected by any other parameter. A value of (.1) is assigned for each parameter affected.

The weighting factor for each parameter represents the sum of the weights for all assessment categories affected by the parameter.

Habitat Parameters

(1)
Signif. to
Fish Life

Biological Assessment Categories

(2)
Limiting
Factor(3)
Influence
of Change(4)
Other Factors
Affected by Change

Weighting Factor (n)

Habitat Parameters	(1) Signif. to Fish Life			Biological Assessment Categories			Weighting Factor (n)
	Survival Requirement	Reproductive Requirement	Maintenance Requirement	(2) Limiting Factor	(3) Influence of Change	(4) Other Factors Affected by Change	
1) Water Quan. (depth, width, etc.)	X	X	X	X	X	X	1.5
2) Water Temperature	X	X	X	X	X	X	.9
3) % Shade	X	X	X	X	X	X	.8
4) Aquatic Food Organisms	X	X	X	X	X	X	.5
5) Pool-Riffle Ratio	X	X	X	X	X	X	.9
6) Channel Stability	X	X	X	X	X	X	.9
7) Pool Grade	X	X	X	X	X	X	.5
8) Spawning Site Avail.	X	X	X	X	X	X	.7

APPENDIX G - Parameter-to-PSI Conversion Chart

Chart

Key to Indicator Species Groups:

- (1) Anadromous Harvest Species (Chinook, Coho Salmon)
- (2) Anadromous Emphasis Species (Summer and Winter Steelhead)
- (3) Resident Trout Species
- (4) Redband Trout Species

Width (Ft.)

(1) <u>Width</u>	<u>PSI</u>	(2) <u>Width</u>	<u>PSI</u>	(3) & (4) <u>Width</u>	<u>PSI</u>
0-2	.1	0-2	.1	0	0
3-4	.2	3	.2	>0-2	.1
5-6	.3	4	.3	3	.2
7-8	.4	5	.4	4	.3
9	.5	6	.5	5	.4
10	.6	7	.6	6	.5
11	.7	8	.7	7	.6
12-13	.8	9-12	.8	8	.7
14-16	.9	13-16	.9	9-12	.8
>16	1.0	>16	1.0	13-16	.9
				>16	1.0

Depth (Ft.)

(1) <u>Depth</u>	<u>PSI</u>	(2) <u>Depth</u>	<u>PSI</u>	(3) & (4) <u>Depth</u>	<u>PSI</u>
0-.7	.1	0-.4	.1	0	0
.8-.9	.2	.5-.6	.2	>0-.4	.1
1.0-1.1	.3	.7-.8	.3	.5-.6	.2
1.2-1.4	.4	.9-1.0	.4	.7-.8	.3
1.5-1.8	.5	1.1-2.4	.5	.9-1.0	.4
1.9-2.2	.6	1.5-1.8	.6	1.1-1.4	.5
2.3-2.6	.7	1.9-2.2	.7	1.5-1.8	.6
2.7-3.0	.8	2.3-2.6	.8	1.9-2.2	.7
3.1-3.5	.9	2.7-2.9	.9	2.7-2.9	.8
>3.5	1.0	>3.0	1.0	>3.0	1.0

Velocity (Ft./Sec.)

(1) & (2)	<u>Velocity</u>	<u>PSI</u>	(3) & (4)	<u>Velocity</u>	<u>PSI</u>
	>3.5 or <.8	.1		>3.7 or <.4	.1
	3.4 or .9	.2		3.6 or .5	.2
	3.3 or 1.0	.3		3.5 or .6	.3
	3.2 or 1.1	.4		3.4 or .7	.4
	3.1 or 1.2	.5		3.3 or .8	.5
	3.0 or 1.3	.6		3.1-3.2 or .9-1.0	.6
	2.9 or 1.4-1.5	.7		2.9-3.0 or 1.1-1.2	.7
	2.7-2.8 or 1.6-1.7	.8		2.7-2.8 or 1.3-1.4	.8
	2.5-2.6 or 1.8-1.9	.9		2.5-2.6 or 1.4-1.5	.9
	2.0-2.4	1.0		2.0-2.4	1.0

Temperature (Degrees Fahrenheit)

(1) <u>Temp.</u>	<u>PSI</u>	(2) <u>Temp.</u>	<u>PSI</u>	(3) & (4) <u>Temp.</u>	<u>PSI</u>
>77 or <37	0	>75 or <38	0	>76 or <37	0
75-77 or 37-38	.1	73-75 or 38	.1	76 or 37-38	.1
73-75 or 39-40	.2	70-72 or 39	.2	74-75 or 39-40	.2
71-72 or 41-42	.3	67-60 or 40	.3	73 or 41-42	.3
68-70 or 43	.4	64-66 or 41	.4	71-72 or 43-44	.4
66-67 or 44-45	.5	61-63 or 42	.5	70 or 45-46	.5
64-65 or 46	.6	60 or 43	.6	68-69 or 47-48	.6
62-63 or 47-48	.7	58-59 or 44	.7	66-67 or 49-50	.7
60-61 or 49	.8	56-57 or 45	.8	62-65 or 51-52	.8
57-59 or 50-51	.9	54-55 or 46-47	.9	58-61 or 53-54	.9
52-56	1.0	48-53	1.0	55-57	1.0

Percent Shade or Canopy (%)

(1 - 4) %	PSI	%	PSI	%	PSI
<24	.1	44-49	.5	86-90 or 60-64	.8
24-29	.2	96-100 or 50-54	.6	81-85 or 65-69	.9
30-36	.3	71-95 or 55-59	.7	70-80	1.0
37-43	.4				

Aquatic Food Organisms (#'s/Ft.²) or F, C, A

(1 - 4) #'s	PSI	#'s	PSI	#'s	PSI
0-2	.1	7-9	.4	C or 14-15	.7
F or 3-4	.2	10-11	.5	16-17	.8
5-6	.3	12-13	.6	18-19	.9
				A or >20	1.0

Pool-Riffle Ratio (% Pools)

(1 - 4) %	PSI	%	PSI	%	PSI
>90 or <9	.1	71-75 or 25-29	.5	56-60 or 40-44	.8
F or A, 86-90 or 9-14	.2	66-70 or 30-34	.6	50-55 or C, 45-49	.9
81-95 or 15-19	.3	61-65 or 35-39	.7	50	1.0
76-80 or 20-24	.4				

Stream Channel Stability (# or VU, VS, U, S, M)

(1 - 4) Stability	PSI	Stability	PSI	Stability	PSI
VU or >120 or VS, <38	.1	109-112 or 44-47	.4	91-95 or 64-69	.8
117-120 or 38-40	.2	U or 106-108 or 48-51	.5	84-90 or 70-76	.9
113-116 or 41-43	.3	101-105 or 52-57	.6	M, 77-83	1.0
		96-100 or 58-63	.7		

Pool Grade (A, B, or C)

(1 - 4) <u>Grade</u>	<u>PSI</u>
C	.3
B	.6
A	.9

Spawning Site Availability (% Gravels in Riffles)

(1 - 4) <u>%</u>	<u>PSI</u>	<u>%</u>	<u>PSI</u>	<u>%</u>	<u>PSI</u>
<15	.1	25-29	.4	50-59	.7
15-19	.2	30-39	.5	60-69	.8
20-24	.3	40-49	.6	70-79	.9
				80-100	1.0

APPENDIX H - Excerpt From FISHOUT (Assessment Program)

REACH: 1 LENGTH: 0.7 MILES WIDTH: 6 FEET AREA: 0.5 ACRES HSI AH: .40 HSI AE: .40 HSI RES + REDBAND: .45
 REACH: 2 LENGTH: 0.7 MILES WIDTH: 3 FEET AREA: 0.3 ACRES HSI AH: .30 HSI AE: .29 HSI RES + REDBAND: .33
 REACH: 3 LENGTH: 0.8 MILES WIDTH: 3 FEET AREA: 0.3 ACRES HSI AH: .30 HSI AE: .29 HSI RES + REDBAND: .33
 HSI ANADROMOUS HARVEST SPECIES : .33
 HSI ANADROMOUS EMPHASIS SPECIES : .33
 HSI RESIDENT TROUT SPECIES : .37
 HSI REDBAND TROUT SPECIES : .37
 MISSING DATA :

NONE

TOTAL LENGTH = 2.2 MILES AREA = 1.05455 ACRES
 UNBLOCKED LENGTH = 1.05 MILES UNBLOCKED AREA = .636364 ACRES

- *****
 STREAM NAME : CONNER C STREAM-MOUTH-LOC : 34N11W36 SURVEY DATE : 05/15/80
 STREAM LENGTH : 4.6 LENGTH NOT SURVEYED : 1.5

REACH: 1 LENGTH: 1.4 MILES WIDTH: 15 FEET AREA: 2.5 ACRES HSI AH: .54 HSI AE: .56 HSI RES + REDBAND: .55
 REACH: 2 LENGTH: 1.7 MILES WIDTH: 15 FEET AREA: 3.1 ACRES HSI AH: .56 HSI AE: .60 HSI RES + REDBAND: .55
 REACH: 3 LENGTH: 1.5 MILES WIDTH: 15 FEET AREA: 2.7 ACRES HSI AH: .56 HSI AE: .60 HSI RES + REDBAND: .55
 HSI ANADROMOUS HARVEST SPECIES : .55
 HSI ANADROMOUS EMPHASIS SPECIES : .59
 HSI RESIDENT TROUT SPECIES : .55
 HSI REDBAND TROUT SPECIES : .55
 MISSING DATA :

NONE

TOTAL LENGTH = 4.6 MILES AREA = 8.36364 ACRES
 UNBLOCKED LENGTH = 4.6 MILES UNBLOCKED AREA = 8.36364 ACRES

- *****
 STREAM NAME : CONNER C STREAM-MOUTH-LOC : 33N11W01 SURVEY DATE : 08/15/74
 STREAM LENGTH : 4.6 LENGTH NOT SURVEYED : 1.1

REACH: 1 LENGTH: 3.5 MILES WIDTH: 10 FEET AREA: 4.0 ACRES HSI AH: .41 HSI AE: .42 HSI RES + REDBAND: .43
 REACH: 2 LENGTH: 1.1 MILES WIDTH: 10 FEET AREA: 1.2 ACRES HSI AH: .41 HSI AE: .42 HSI RES + REDBAND: .43
 HSI ANADROMOUS HARVEST SPECIES : .41
 HSI ANADROMOUS EMPHASIS SPECIES : .42
 HSI RESIDENT TROUT SPECIES : .43
 HSI REDBAND TROUT SPECIES : .43
 MISSING DATA :

VELOCITY

TOTAL LENGTH = 4.6 MILES AREA = 5.57576 ACRES
 UNBLOCKED LENGTH = 4.6 MILES UNBLOCKED AREA = 5.57576 ACRES

APPENDIX I - Source Programs

FISHIN-BAS (REM FISH INPUT SECTION)

FISHOUT-BAS (REM PROGRAM TO CALCULATE FISH VALUES)

FISHLIST-BAS (REM PROGRAM TO LIST FISH DATA)

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10 REM FISH INPUT SECTION
40 PRINT "ENTER NAME OF FILE TO STORE DATA"
50 INPUT Z$
60 OPEN Z$ FOR OUTPUT AS FILE #2
70 GO TO 130
120 PRINT CHR$(7)
130 PRINT "ENTER CARD CODE (1 FOR STREAM, 2 FOR REACH, 3 FOR SPECIES)"
140 PRINT "OR IF FINISHED, ENTER:STOP"
150 INPUT A$
160 IF A$="STOP" GO TO 4000
170 IF A$<>"1" GO TO 450
180 GO TO 200
190 PRINT CHR$(7)
200 PRINT "ENTER STREAM CODE (MAX OF 13 CHAR)"
204 INPUT B1$
208 IF LEN(B1$)>13 GO TO 190
210 FOR M=LEN(B1$) TO 12 \ B1$=B1$&" " \ NEXT M
212 GO TO 220
218 PRINT CHR$(7)
220 PRINT "ENTER STREAM NAME (MAX OF 14 CHAR)"
224 INPUT A1$
228 IF LEN(A1$)>14 GO TO 218
230 IF LEN(A1$)>0 GO TO 250
240 A1$=B$
250 B$=A1$
255 FOR M=LEN(A1$) TO 13 \ A1$=A1$&" " \ NEXT M \ GO TO 320
310 PRINT CHR$(7)
320 PRINT "ENTER STREAM MOUTH LOCATION (MAX OF 8 CHAR)"
330 INPUT C1$
340 IF LEN(C1$)>8 GO TO 310
350 FOR M=LEN(C1$) TO 7 \ C1$=C1$&" " \ NEXT M
360 GO TO 370
365 PRINT CHR$(7)
370 PRINT "ENTER STREAM LENGTH (0.0 TO 99.9)"
380 INPUT D1$
390 IF VAL(D1$)>99.9 GO TO 365
395 A=LEN(D1$)-1
400 IF SEG$(D1$,A,A)<>"." GO TO 365
410 IF LEN(D1$)=3 THEN D1$=" "&D1$
415 IF LEN(D1$)=2 THEN D1$=" "&D1$
420 PRINT #2:"1";A1$;"00";B1$;C1$;D1$
440 GO TO 130
450 IF A$<>"2" GO TO 3020
460 GO TO 480
470 PRINT CHR$(7)
480 PRINT "ENTER STREAM NAME (MAX OF 14 CHAR)"
490 PRINT "(OR HIT RETURN TO DUPLICATE THE LAST NAME ENTERED)"
500 INPUT A2$
510 IF LEN(A2$)>14 GO TO 470
520 IF LEN(A2$)>0 GO TO 540
530 A2$=B$
540 B$=A2$
550 FOR M=LEN(A2$) TO 13 \ A2$=A2$&" " \ NEXT M \ GO TO 580
570 PRINT CHR$(7)
580 PRINT "ENTER REACH # (MAX OF 2 DIGITS)"
590 INPUT B2$
600 IF LEN(B2$)>2 GO TO 570
610 IF LEN(B2$)=1 THEN B2$=" "&B2$
620 IF LEN(B2$)=0 GO TO 570
630 GO TO 650
640 PRINT CHR$(7)
650 PRINT "ENTER REACH LENGTH (0.0 TO 99.9)"
660 INPUT D2$
670 IF VAL(D2$)>99.9 GO TO 640

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690 IF SEG$(D2$,A2,A2)<>". " GO TO 640
700 IF LEN(D2$)=2 THEN D2$=" "&D2$
710 IF LEN(D2$)=3 THEN D2$=" "&D2$
720 GO TO 740
730 PRINT CHR$(7)
740 PRINT "ENTER SURVEY DATE (MMDDYY) OR IF NO SURVEY HIT RETURN"
750 INPUT C2$
752 IF LEN(C2$)<>0 GO TO 770
754 C2$="000000"
756 PRINT #2:"2";A2$;B2$;C2$;D2$
758 PRINT #2:"3";A2$;B2$;C2$
760 PRINT #2:"4";A2$;B2$;C2$
762 GO TO 130
770 IF LEN(C2$)<>6 GO TO 730
780 GO TO 800
790 PRINT CHR$(7)
800 PRINT "ENTER *61* REL-PRECIP (I.E. 8.1)"
810 INPUT E2$
815 IF LEN(E2$)=0 THEN E2$="0.0"
820 E2=LEN(E2$)-1
830 IF SEG$(E2$,E2,E2)<>". " GO TO 790
840 IF LEN(E2$)>5 GO TO 790
850 FOR M=LEN(E2$) TO 4 \ E2$=" "&E2$ \ NEXT M \ GO TO 880
870 PRINT CHR$(7)
880 PRINT "ENTER *62* MAX-TEMP(YR)"
890 INPUT F2$
900 IF LEN(F2$)>3 GO TO 870
910 FOR M=LEN(F2$) TO 2 \ F2$=" "&F2$ \ NEXT M \ GO TO 940
930 PRINT CHR$(7)
940 PRINT "ENTER *7* AVE-DEPTH (I.E. 0.5)"
950 INPUT G2$
960 G2=LEN(G2$)-1
970 IF SEG$(G2$,G2,G2)<>". " GO TO 930
980 IF LEN(G2$)>4 GO TO 930
990 FOR M=LEN(G2$) TO 3 \ G2$=" "&G2$ \ NEXT M \ GO TO 1020
1010 PRINT CHR$(7)
1020 PRINT "ENTER *8* AVE-WETTED-WIDTH (I.E. 8)"
1030 INPUT H2$
1035 IF LEN(H2$)=0 GO TO 1010
1040 IF LEN(H2$)>2 GO TO 1010
1050 FOR M=LEN(H2$) TO 1 \ H2$=" "&H2$ \ NEXT M \ GO TO 1080
1070 PRINT CHR$(7)
1080 PRINT "ENTER *9* VELOCITY (I.E. 0.8)"
1090 INPUT I2$
1100 IF LEN(I2$)>3 GO TO 1070
1110 I2=LEN(I2$)-1
1120 IF SEG$(I2$,I2,I2)<>". " GO TO 1070
1130 FOR M=LEN(I2$) TO 2 \ I2$=" "&I2$ \ NEXT M
1140 GO TO 1160
1150 PRINT CHR$(7)
1160 PRINT "ENTER *10* RELIAB-7-9 (1 DIGIT)"
1170 INPUT J2$
1180 IF LEN(J2$)<>1 GO TO 1150
1190 GO TO 1210
1200 PRINT CHR$(7)
1210 PRINT "ENTER *111* POOLS (MAX 3 DIGITS)"
1212 PRINT "OR IF BLANK HIT RETURN"
1220 INPUT K2$
1222 IF LEN(K2$)=0 THEN K2$=" " \ L2$=" " \ M2$=" " \ GO TO 1390
1230 IF LEN(K2$)>3 GO TO 1200
1240 FOR M=LEN(K2$) TO 2 \ K2$=" "&K2$ \ NEXT M \ GO TO 1270
1260 PRINT CHR$(7)
1270 PRINT "ENTER *211* RUNS (MAX OF 3 DIGITS)"
1280 INPUT L2$
1290 IF LEN(L2$)>3 GO TO 1260

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1320 PRINT CHR$(7)
1330 PRINT "ENTER *311* RIFF (MAX 3 DIGITS)"
1340 INPUT M2$
1350 IF LEN(M2$)>3 GO TO 1320
1355 N2$=" " \ Q2$=" " \ P2$=" "
1360 FOR M=LEN(M2$) TO 2 \ M2$=" "&M2$ \ NEXT M \ GO TO 1540
1380 PRINT CHR$(7)
1390 PRINT "ENTER *112* POOLS (F,C,A)"
1400 INPUT N2$
1410 IF LEN(N2$)<>1 GO TO 1380
1420 GO TO 1440
1430 PRINT CHR$(7)
1440 PRINT "ENTER *212* RUNS (F,C,A)"
1450 INPUT Q2$
1460 IF LEN(Q2$)<>1 GO TO 1430
1470 GO TO 1490
1480 PRINT CHR$(7)
1490 PRINT "ENTER *312* RIFF (F,C,A)"
1500 INPUT P2$
1510 IF LEN(P2$)<>1 GO TO 1480
1520 GO TO 1540
1530 PRINT CHR$(7)
1540 PRINT "ENTER *13* RELIAB-111-312 (1 DIGIT)"
1550 INPUT Q2$
1560 IF LEN(Q2$)<>1 GO TO 1530
1570 PRINT #2:"2";A2$;B2$;C2$;D2$;E2$;F2$;G2$;H2$;I2$;J2$;K2$;L2$;M2$;
1580 PRINT #2:N2$;Q2$;P2$;Q2$
1590 GO TO 1610
1600 PRINT CHR$(7)
1610 PRINT "ENTER *114* BEDROCK (MAX 3 DIGITS)"
1620 INPUT A3$
1630 IF LEN(A3$)>3 GO TO 1600
1640 FOR M=LEN(A3$) TO 2 \ A3$=" "&A3$ \ NEXT M \ GO TO 1670
1660 PRINT CHR$(7)
1670 PRINT "ENTER *214* BOULDERS (MAX 3 DIGITS)"
1680 INPUT B3$
1690 IF LEN(B3$)>3 GO TO 1660
1700 FOR M=LEN(B3$) TO 2 \ B3$=" "&B3$ \ NEXT M \ GO TO 1720
1710 PRINT CHR$(7)
1720 PRINT "ENTER *314* ROCKS (MAX 3 DIGITS)"
1730 INPUT C3$
1740 IF LEN(C3$)>3 GO TO 1710
1750 FOR M=LEN(C3$) TO 2 \ C3$=" "&C3$ \ NEXT M \ GO TO 1770
1760 PRINT CHR$(7)
1770 PRINT "ENTER *414* RUBBLE (MAX 3 DIGITS)"
1780 INPUT D3$
1790 IF LEN(D3$)>3 GO TO 1760
1800 FOR M=LEN(D3$) TO 2 \ D3$=" "&D3$ \ NEXT M \ GO TO 1820
1810 PRINT CHR$(7)
1820 PRINT "ENTER *514* GRAVEL (MAX 3 DIGITS)"
1830 INPUT E3$
1840 IF LEN(E3$)>3 GO TO 1810
1850 FOR M=LEN(E3$) TO 2 \ E3$=" "&E3$ \ NEXT M \ GO TO 1870
1860 PRINT CHR$(7)
1870 PRINT "ENTER *614* SAND (MAX 3 DIGITS)"
1880 INPUT F3$
1890 IF LEN(F3$)>3 GO TO 1860
1900 FOR M=LEN(F3$) TO 2 \ F3$=" "&F3$ \ NEXT M \ GO TO 1920
1910 PRINT CHR$(7)
1920 PRINT "ENTER *714* SILT,MUD (MAX 3 DIGITS)"
1930 INPUT G3$
1940 IF LEN(G3$)>3 GO TO 1910
1950 FOR M=LEN(G3$) TO 2 \ G3$=" "&G3$ \ NEXT M \ GO TO 1970
1960 PRINT CHR$(7)
1970 PRINT "ENTER *116* BEDROCK (MAX 3 DIGITS)"

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1990 IF LEN(H3$)>3 GO TO 1960
2000 FOR M=LEN(H3$) TO 2 \ H3$=" "&H3$ \ NEXT M \ GO TO 2020
2010 PRINT CHR$(7)
2020 PRINT "ENTER *216* BOULDERS (MAX 3 DIGITS)"
2030 INPUT I3$
2040 IF LEN(I3$)>3 GO TO 2010
2050 FOR M=LEN(I3$) TO 2 \ I3$=" "&I3$ \ NEXT M \ GO TO 2070
2060 PRINT CHR$(7)
2070 PRINT "ENTER *316* ROCKS (MAX 3 DIGITS)"
2080 INPUT J3$
2090 IF LEN(J3$)>3 GO TO 2060
2100 FOR M=LEN(J3$) TO 2 \ J3$=" "&J3$ \ NEXT M \ GO TO 2120
2110 PRINT CHR$(7)
2120 PRINT "ENTER *416* RUBBLE (MAX 3 DIGITS)"
2130 INPUT K3$
2140 IF LEN(K3$)>3 GO TO 2110
2150 FOR M=LEN(K3$) TO 2 \ K3$=" "&K3$ \ NEXT M \ GO TO 2170
2160 PRINT CHR$(7)
2170 PRINT "ENTER *516* GRAVEL (MAX 3 DIGITS)"
2180 INPUT L3$
2190 IF LEN(L3$)>3 GO TO 2160
2200 FOR M=LEN(L3$) TO 2 \ L3$=" "&L3$ \ NEXT M \ GO TO 2220
2210 PRINT CHR$(7)
2220 PRINT "ENTER *616* SAND (MAX 3 DIGITS)"
2230 INPUT M3$
2240 IF LEN(M3$)>3 GO TO 2210
2250 FOR M=LEN(M3$) TO 2 \ M3$=" "&M3$ \ NEXT M \ GO TO 2270
2260 PRINT CHR$(7)
2270 PRINT "ENTER *716* SILT,MUD (MAX 3 DIGITS)"
2280 INPUT N3$
2290 IF LEN(N3$)>3 GO TO 2260
2300 FOR M=LEN(N3$) TO 2 \ N3$=" "&N3$ \ NEXT M
2320 PRINT #2;"3";A2$;B2$;C2$;A3$;B3$;C3$;D3$;E3$;F3$;G3$;H3$;I3$;
2330 PRINT #2;J3$;K3$;L3$;M3$;N3$
2340 GO TO 2360
2350 PRINT CHR$(7)
2360 PRINT "ENTER *17* RELIAB-114-716 (1 DIGIT)"
2370 INPUT B4$
2380 IF LEN(B4$)<>1 GO TO 2350
2390 GO TO 2410
2400 PRINT CHR$(7)
2410 PRINT "ENTER *15* (1 CHAR)"
2420 INPUT A4$
2430 IF LEN(A4$)<>1 GO TO 2400
2440 GO TO 2460
2450 PRINT CHR$(7)
2460 PRINT "ENTER *18* (2 DIGITS)"
2470 INPUT C4$
2480 IF LEN(C4$)<>2 GO TO 2450
2490 GO TO 2510
2500 PRINT CHR$(7)
2510 PRINT "ENTER *180* (1 DIGIT)"
2520 INPUT D4$
2530 IF LEN(D4$)<>1 GO TO 2500
2540 GO TO 2560
2550 PRINT CHR$(7)
2560 PRINT "ENTER *181* (0.00 TO 999.99)"
2570 INPUT E4$
2580 E4=LEN(E4$)-1
2590 IF SEG$(E4$,E4,E4)="." THEN E4$=E4$&"0"
2600 IF SEG$(E4$,LEN(E4$)-2,LEN(E4$)-2)<>"," GO TO 2550
2610 IF LEN(E4$)>6 GO TO 2550
2620 FOR M=LEN(E4$) TO 5 \ E4$=" "&E4$ \ NEXT M \ GO TO 2650
2640 PRINT CHR$(7)
2650 PRINT "ENTER *19* (MAX 3 DIGITS)"

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2660 INPUT F4$
2662 IF LEN(F4$)=0 GO TO 2710
2670 IF LEN(F4$)>3 GO TO 2640
2675 G4$=" "
2680 FOR M=LEN(F4$) TO 2 \ F4$=" "&F4$ \ NEXT M \ GO TO 2760
2700 PRINT CHR$(7)
2710 PRINT "ENTER *20* (1 CHAR)"
2720 INPUT G4$
2730 IF LEN(G4$)<>1 GO TO 2700
2735 F4$=" "
2740 GO TO 2760
2750 PRINT CHR$(7)
2760 PRINT "ENTER *21* (1 DIGIT)"
2770 INPUT H4$
2780 IF LEN(H4$)<>1 GO TO 2750
2790 GO TO 2805
2800 PRINT CHR$(7)
2805 PRINT "ENTER *22* (MAX 3 DIGITS)"
2810 INPUT I4$
2820 IF LEN(I4$)>3 GO TO 2800
2830 FOR M=LEN(I4$) TO 2 \ I4$=" "&I4$ \ NEXT M \ GO TO 2850
2840 PRINT CHR$(7)
2850 PRINT "ENTER *250* (1 CHAR)"
2860 INPUT L4$
2870 IF LEN(L4$)<>1 GO TO 2840
2880 GO TO 2900
2890 PRINT CHR$(7)
2900 PRINT "ENTER *23* (MAX 3 DIGITS)"
2910 INPUT J4$
2920 IF LEN(J4$)>3 GO TO 2890
2930 FOR M=LEN(J4$) TO 2 \ J4$=" "&J4$ \ NEXT M \ GO TO 2950
2940 PRINT CHR$(7)
2950 PRINT "ENTER *24* (MAX 2 CHAR)"
2960 INPUT K4$
2970 IF LEN(K4$)>2 GO TO 2940
2980 FOR M=LEN(K4$) TO 1 \ K4$=K4$&" " \ NEXT M
2990 PRINT #2;"4";A2$;B2$;C2$;A4$;B4$;C4$;D4$;E4$;F4$;G4$;H4$;I4$;
3000 PRINT #2;J4$;K4$;L4$
3010 GO TO 130
3020 IF A$<>"3" GO TO 120
3021 GO TO 3023
3022 PRINT CHR$(7)
3023 PRINT "ENTER STREAM NAME (MAX 14 CHAR)"
3024 PRINT "OR HIT RETURN TO DUPLICATE THE LAST STREAM NAME ENTERED"
3025 INPUT A5$
3026 IF LEN(A5$)>14 GO TO 3022
3028 IF LEN(A5$)>0 GO TO 3032
3030 A5$=B$
3032 B$=A5$
3034 FOR M=LEN(A5$) TO 13 \ A5$=A5$&" " \ NEXT M \ GO TO 3038
3036 PRINT CHR$(7)
3038 PRINT "ENTER REACH # (MAX 2 DIGITS)"
3040 INPUT B5$
3042 IF LEN(B5$)>2 GO TO 3036
3044 IF LEN(B5$)=1 THEN B5$=" "&B5$
3046 IF LEN(B5$)=0 GO TO 3036
3048 GO TO 3050
3049 PRINT CHR$(7)
3050 PRINT "ENTER SURVEY DATE (MMDDYY)"
3051 PRINT "OR HIT RETURN TO DUPLICATE LAST DATE ENTERED"
3052 INPUT C5$
3053 IF LEN(C5$)<>6 GO TO 3055
3054 C5$=C2$
3055 C2$=C5$
3056 IF LEN(C5$)<>6 GO TO 3049

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3058 PRINT CHR$(7)
3060 PRINT "ENTER *125* (MAX 5 CHAR)"
3065 INPUT D5$
3070 IF LEN(D5$)>5 GO TO 3058
3080 FOR M=LEN(D5$) TO 4 \ D5$=D5$3" " \ NEXT M \ GO TO 3100
3090 PRINT CHR$(7)
3100 PRINT "ENTER *225* (0.00 TO 999.99)"
3110 INPUT E5$
3115 IF LEN(E5$)=0 THEN E5$="0.00" \ GO TO 3150
3120 IF LEN(E5$)>6 GO TO 3090
3130 E5=LEN(E5$)-2
3140 IF SEG$(E5$,E5,E5)<>". " GO TO 3090
3150 FOR M=LEN(E5$) TO 5 \ E5$=" "&E5$ \ NEXT M \ GO TO 3170
3160 PRINT CHR$(7)
3170 PRINT "ENTER *325* (1 CHAR)"
3180 INPUT F5$
3190 IF LEN(F5$)<>1 GO TO 3160
3200 GO TO 3220
3210 PRINT CHR$(7)
3220 PRINT "ENTER *425* (1 DIGIT)"
3230 INPUT G5$
3240 IF LEN(G5$)<>1 GO TO 3210
3250 PRINT #2:"5";A5$;B5$;C5$;D5$;E5$;F5$;G5$
3260 GO TO 130
4000 CLOSE
4010 END
```

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10 REM PROGRAM TO CALCULATE FISH VALUES
20 OPEN "LP:" FOR OUTPUT AS FILE #2
22 P9$="REACH: ## LENGTH: ##.## MILES WIDTH: ## FEET AREA: ####.## ACRES
SI AH: .## HSI AE: .## HSI RES + REDBAND: .##"
30 DIM B$(30),L(30),W(30),N(30),H(30,3),F(10),G(10)
32 X$="*" \ FOR M=1 TO 130 \ X$=X$&"*" \ NEXT M
40 A6=0 \ L6=0
70 PRINT "ENTER NAME OF FILE THAT FISH DATA IS STORED"
80 INPUT Z$
82 PRINT #2:X$
84 PRINT #2:"NAME OF FISH DATA FILE : ";Z$
86 PRINT #2:X$
90 OPEN Z$ FOR INPUT AS FILE #1
100 LINPUT #1:Y$
130 IF SEG$(Y$,1,1)<>"1" THEN PRINT "CARD 1 EXPECTED" \ GO TO 110
132 FOR M=1 TO 10 \ G(M)=0 \ NEXT M
133 I=0
134 C9$="000000" \ L=0 \ E=0
140 A1$=SEG$(Y$,2,15)
150 C1$=SEG$(Y$,31,38)
152 D1$=SEG$(Y$,39,42)
160 LINPUT #1:Y$
180 IF SEG$(Y$,1,1)<>"2" THEN PRINT "CARD 2 EXPECTED" \ GO TO 110
181 I=I+1
182 C2$=SEG$(Y$,18,23)
183 FOR M=1 TO 10 \ F(M)=0 \ NEXT M
184 L(I)=VAL(SEG$(Y$,24,27))
186 IF C2$>C9$ THEN C9$=C2$
190 G2$=SEG$(Y$,36,39)
200 H2$=SEG$(Y$,40,41)
202 Z=POS(H2$,"Z",1)
204 IF Z>0 THEN W(I)=99 \ GO TO 208
206 W(I)=VAL(H2$)
208 N(I)=VAL(SEG$(Y$,16,17))
210 I2$=SEG$(Y$,42,44)
220 K2$=SEG$(Y$,46,48)
230 N2$=SEG$(Y$,55,55)
242 IF C2$<>"000000" GO TO 240
238 IF END #1 THEN PRINT "END" \ H(I,1)=99 \ H(I,2)=99 \ H(I,3)=99 \ L=L+L(I)
W(I)=99 \ GO TO 3060
240 LINPUT #1:Y$
242 IF C2$<>"000000" GO TO 260
243 IF SEG$(Y$,1,1)="3" GO TO 270
244 H(I,1)=99 \ H(I,2)=99 \ H(I,3)=99 \ L=L+L(I) \ W(I)=99 \ GO TO 3020
260 IF SEG$(Y$,1,1)<>"3" THEN PRINT "CARD 3 EXPECTED" \ GO TO 110
270 L3$=SEG$(Y$,57,59)
280 LINPUT #1:Y$
300 IF SEG$(Y$,1,1)<>"4" THEN PRINT "CARD 4 EXPECTED" \ GO TO 110
310 C4$=SEG$(Y$,26,27)
320 I4$=SEG$(Y$,40,42)
330 F4$=SEG$(Y$,35,37)
332 G4$=SEG$(Y$,38,38)
340 J4$=SEG$(Y$,43,45)
342 K4$=SEG$(Y$,46,47)
350 A4$=SEG$(Y$,24,24)
355 B$(I)=SEG$(Y$,48,48)
360 IF C2$="000000" THEN H(I,1)=99 \ H(I,2)=99 \ H(I,3)=99 \ L=L+L(I) \ W(I)=99
\ GO TO 3014
370 Z=POS(G2$,"Z",1)
380 IF Z>0 THEN F(1)=1 \ G(1)=1 \ D1=0 \ D2=0 \ D3=0 \ GO TO 590
390 IF VAL(G2$)<=.7 THEN D1=.1 \ GO TO 485
400 IF VAL(G2$)<=.9 THEN D1=.2 \ GO TO 490
410 IF VAL(G2$)<=1.1 THEN D1=.3 \ GO TO 490
420 IF VAL(G2$)<=1.4 THEN D1=.4 \ GO TO 490

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440 IF VAL(G2$)<=2.2 THEN D1=.6 \ GO TO 490
450 IF VAL(G2$)<=2.6 THEN D1=.7 \ GO TO 490
460 IF VAL(G2$)<=3 THEN D1=.8 \ GO TO 490
470 IF VAL(G2$)<=3.5 THEN D1=.9 \ GO TO 490
480 D1=1
485 IF VAL(G2$)=0 THEN D3=0 \ D2=.1 \ GO TO 590
490 IF VAL(G2$)<=.4 THEN D2=.1 \ D3=.1 \ GO TO 590
500 IF VAL(G2$)<=.6 THEN D2=.2 \ D3=.2 \ GO TO 590
510 IF VAL(G2$)<=.8 THEN D2=.3 \ D3=.3 \ GO TO 590
520 IF VAL(G2$)<=1 THEN D2=.4 \ D3=.4 \ GO TO 590
530 IF VAL(G2$)<=1.4 THEN D2=.5 \ D3=.5 \ GO TO 590
540 IF VAL(G2$)<=1.8 THEN D2=.6 \ D3=.6 \ GO TO 590
550 IF VAL(G2$)<=2.2 THEN D2=.7 \ D3=.7 \ GO TO 590
560 IF VAL(G2$)<=2.6 THEN D2=.8 \ D3=.8 \ GO TO 590
570 IF VAL(G2$)<=2.9 THEN D2=.9 \ D3=.9 \ GO TO 590
580 D2=1 \ D3=1
590 Z=POS(H2$,"Z",1)
600 IF Z>0 THEN F(2)=1 \ G(2)=1 \ W1=0 \ W2=0 \ W3=0 \ GO TO 820
605 H2=VAL(H2$)
610 IF H2<=2 THEN W1=.1 \ GO TO 710
620 IF H2<=4 THEN W1=.2 \ GO TO 710
630 IF H2<=6 THEN W1=.3 \ GO TO 710
640 IF H2<=8 THEN W1=.4 \ GO TO 710
650 IF H2<=9 THEN W1=.5 \ GO TO 710
660 IF H2<=10 THEN W1=.6 \ GO TO 710
670 IF H2<=11 THEN W1=.7 \ GO TO 710
680 IF H2<=13 THEN W1=.8 \ GO TO 710
690 IF H2<=16 THEN W1=.9 \ GO TO 710
700 W1=1
710 IF H2=0 THEN W2=.1 \ W3=0 \ GO TO 820
720 IF H2<=2 THEN W2=.1 \ W3=.1 \ GO TO 820
730 IF H2<=3 THEN W2=.2 \ W3=.2 \ GO TO 820
740 IF H2<=4 THEN W2=.3 \ W3=.3 \ GO TO 820
750 IF H2<=5 THEN W2=.4 \ W3=.4 \ GO TO 820
760 IF H2<=6 THEN W2=.5 \ W3=.5 \ GO TO 820
770 IF H2<=7 THEN W2=.6 \ W3=.6 \ GO TO 820
780 IF H2<=8 THEN W2=.7 \ W3=.7 \ GO TO 820
790 IF H2<=12 THEN W2=.8 \ W3=.8 \ GO TO 820
800 IF H2<=16 THEN W2=.9 \ W3=.9 \ GO TO 820
810 W2=1 \ W3=1
820 Z=POS(I2$,"Z",1)
830 IF Z>0 THEN F(3)=1 \ G(3)=1 \ V1=0 \ V2=0 \ GO TO 1220
835 I2=VAL(I2$)
840 IF I2<=.8 THEN V1=.1 \ GO TO 1030
850 IF I2<=.9 THEN V1=.2 \ GO TO 1030
860 IF I2<=1 THEN V1=.3 \ GO TO 1030
870 IF I2<=1.1 THEN V1=.4 \ GO TO 1030
880 IF I2<=1.2 THEN V1=.5 \ GO TO 1030
890 IF I2<=1.3 THEN V1=.6 \ GO TO 1030
900 IF I2<=1.5 THEN V1=.7 \ GO TO 1030
910 IF I2<=1.7 THEN V1=.8 \ GO TO 1030
920 IF I2<=1.9 THEN V1=.9 \ GO TO 1030
930 IF I2<=2.4 THEN V1=1 \ GO TO 1030
940 IF I2<=2.6 THEN V1=.9 \ GO TO 1030
950 IF I2<=2.8 THEN V1=.8 \ GO TO 1030
960 IF I2<=2.9 THEN V1=.7 \ GO TO 1030
970 IF I2<=3 THEN V1=.6 \ GO TO 1030
980 IF I2<=3.1 THEN V1=.5 \ GO TO 1030
990 IF I2<=3.2 THEN V1=.4 \ GO TO 1030
1000 IF I2<=3.3 THEN V1=.3 \ GO TO 1030
1010 IF I2<=3.4 THEN V1=.2 \ GO TO 1030
1020 V1=.1
1030 IF I2<=.4 THEN V2=.1 \ GO TO 1220
1040 IF I2<=.5 THEN V2=.2 \ GO TO 1220
1050 IF I2<=.6 THEN V2=.3 \ GO TO 1220

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1070 IF I2<=.8 THEN V2=.5 \ GO TO 1220
1080 IF I2<=1 THEN V2=.6 \ GO TO 1220
1090 IF I2<=1.2 THEN V2=.7 \ GO TO 1220
1100 IF I2<=1.4 THEN V2=.8 \ GO TO 1220
1110 IF I2<=1.5 THEN V2=.9 \ GO TO 1220
1120 IF I2<=2.4 THEN V2=1 \ GO TO 1220
1130 IF I2<=2.6 THEN V2=.9 \ GO TO 1220
1140 IF I2<=2.8 THEN V2=.8 \ GO TO 1220
1150 IF I2<=3 THEN V2=.7 \ GO TO 1220
1160 IF I2<=3.2 THEN V2=.6 \ GO TO 1220
1170 IF I2<=3.3 THEN V2=.5 \ GO TO 1220
1180 IF I2<=3.4 THEN V2=.4 \ GO TO 1220
1190 IF I2<=3.5 THEN V2=.3 \ GO TO 1220
1200 IF I2<=3.6 THEN V2=.2 \ GO TO 1220
1210 V2=.1
1220 N=0
1240 FOR M=1 TO 3
1250 IF F(M)=1 THEN 1270
1260 N=N+1
1270 NEXT M
1290 Z=POS(C4$,"Z",1)
1300 IF Z>0 THEN F(4)=1 \ G(4)=1 \ GO TO 1950
1305 C4=VAL(C4$)
1310 IF C4=0 THEN F(4)=1 \ G(4)=1 \ GO TO 1950
1320 IF C4<37 THEN T1=0 \ GO TO 1530
1330 IF C4<=38 THEN T1=.1 \ GO TO 1530
1340 IF C4<=40 THEN T1=.2 \ GO TO 1530
1350 IF C4<=42 THEN T1=.3 \ GO TO 1530
1360 IF C4<=43 THEN T1=.4 \ GO TO 1530
1370 IF C4<=45 THEN T1=.5 \ GO TO 1530
1380 IF C4<=46 THEN T1=.6 \ GO TO 1530
1390 IF C4<=48 THEN T1=.7 \ GO TO 1530
1400 IF C4<=49 THEN T1=.8 \ GO TO 1530
1410 IF C4<=51 THEN T1=.9 \ GO TO 1530
1420 IF C4<=56 THEN T1=1 \ GO TO 1530
1430 IF C4<=59 THEN T1=.9 \ GO TO 1530
1440 IF C4<=61 THEN T1=.8 \ GO TO 1530
1450 IF C4<=63 THEN T1=.7 \ GO TO 1530
1460 IF C4<=65 THEN T1=.6 \ GO TO 1530
1470 IF C4<=67 THEN T1=.5 \ GO TO 1530
1480 IF C4<=70 THEN T1=.4 \ GO TO 1530
1490 IF C4<=72 THEN T1=.3 \ GO TO 1530
1500 IF C4<=75 THEN T1=.2 \ GO TO 1530
1510 IF C4<=77 THEN T1=.1 \ GO TO 1530
1520 T1=0
1530 IF C4<38 THEN T2=0 \ GO TO 1740
1540 IF C4<=38 THEN T2=.1 \ GO TO 1740
1550 IF C4<=39 THEN T2=.2 \ GO TO 1740
1560 IF C4<=40 THEN T2=.3 \ GO TO 1740
1570 IF C4<=41 THEN T2=.4 \ GO TO 1740
1580 IF C4<=42 THEN T2=.5 \ GO TO 1740
1590 IF C4<=43 THEN T2=.6 \ GO TO 1740
1600 IF C4<=44 THEN T2=.7 \ GO TO 1740
1610 IF C4<=45 THEN T2=.8 \ GO TO 1740
1620 IF C4<=47 THEN T2=.9 \ GO TO 1740
1630 IF C4<=53 THEN T2=1 \ GO TO 1740
1640 IF C4<=55 THEN T2=.9 \ GO TO 1740
1650 IF C4<=57 THEN T2=.8 \ GO TO 1740
1660 IF C4<=59 THEN T2=.7 \ GO TO 1740
1670 IF C4<=60 THEN T2=.6 \ GO TO 1740
1680 IF C4<=63 THEN T2=.5 \ GO TO 1740
1690 IF C4<=66 THEN T2=.4 \ GO TO 1740
1700 IF C4<=69 THEN T2=.3 \ GO TO 1740
1710 IF C4<=72 THEN T2=.2 \ GO TO 1740
1720 IF C4<=75 THEN T2=.1 \ GO TO 1740

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1740 IF C4<37 THEN T3=0 \ GO TO 1950
1750 IF C4<=38 THEN T3=.1 \ GO TO 1950
1760 IF C4<=40 THEN T3=.2 \ GO TO 1950
1770 IF C4<=42 THEN T3=.3 \ GO TO 1950
1780 IF C4<=44 THEN T3=.4 \ GO TO 1950
1790 IF C4<=46 THEN T3=.5 \ GO TO 1950
1800 IF C4<=48 THEN T3=.6 \ GO TO 1950
1810 IF C4<=50 THEN T3=.7 \ GO TO 1950
1820 IF C4<=52 THEN T3=.8 \ GO TO 1950
1830 IF C4<=54 THEN T3=.9 \ GO TO 1950
1840 IF C4<=57 THEN T3=1 \ GO TO 1950
1850 IF C4<=61 THEN T3=.9 \ GO TO 1950
1860 IF C4<=65 THEN T3=.8 \ GO TO 1950
1870 IF C4<=67 THEN T3=.7 \ GO TO 1950
1880 IF C4<=69 THEN T3=.6 \ GO TO 1950
1890 IF C4<=70 THEN T3=.5 \ GO TO 1950
1900 IF C4<=72 THEN T3=.4 \ GO TO 1950
1910 IF C4<=73 THEN T3=.3 \ GO TO 1950
1920 IF C4<=75 THEN T3=.2 \ GO TO 1950
1930 IF C4<=76 THEN T3=.1 \ GO TO 1950
1940 T3=0
1950 Z=POS(I4$,'Z',1)
1960 IF Z>0 THEN F(5)=1 \ G(5)=1 \ GO TO 2110
1965 I4=VAL(I4$)
1970 IF I4<24 THEN S=.1 \ GO TO 2110
1980 IF I4<30 THEN S=.2 \ GO TO 2110
1990 IF I4<37 THEN S=.3 \ GO TO 2110
2000 IF I4<44 THEN S=.4 \ GO TO 2110
2010 IF I4<50 THEN S=.5 \ GO TO 2110
2020 IF I4<55 THEN S=.6 \ GO TO 2110
2030 IF I4<60 THEN S=.7 \ GO TO 2110
2040 IF I4<65 THEN S=.8 \ GO TO 2110
2050 IF I4<70 THEN S=.9 \ GO TO 2110
2060 IF I4<81 THEN S=1 \ GO TO 2110
2070 IF I4<86 THEN S=.9 \ GO TO 2110
2080 IF I4<91 THEN S=.8 \ GO TO 2110
2090 IF I4<96 THEN S=.7 \ GO TO 2110
2100 S=.6
2110 IF F4$=' ' THEN 2220
2111 Z=POS(F4$,'Z',1)
2112 IF Z>0 THEN 2250
2115 F4=VAL(F4$)
2120 IF F4<3 THEN A=.1 \ GO TO 2260
2130 IF F4<5 THEN A=.2 \ GO TO 2260
2140 IF F4<7 THEN A=.3 \ GO TO 2260
2150 IF F4<10 THEN A=.4 \ GO TO 2260
2160 IF F4<12 THEN A=.5 \ GO TO 2260
2170 IF F4<14 THEN A=.6 \ GO TO 2260
2180 IF F4<16 THEN A=.7 \ GO TO 2260
2190 IF F4<18 THEN A=.8 \ GO TO 2260
2200 IF F4<20 THEN A=.9 \ GO TO 2260
2210 A=1 \ GO TO 2260
2220 IF G4$='F' THEN A=.2 \ GO TO 2260
2230 IF G4$='C' THEN A=.7 \ GO TO 2260
2240 IF G4$='A' THEN A=1 \ GO TO 2260
2250 F(6)=1 \ G(6)=1
2260 IF K2$=' ' THEN 2460
2261 Z=POS(K2$,'Z',1)
2262 IF Z>0 THEN 2490
2265 K2=VAL(K2$)
2270 IF K2<9 THEN P=.1 \ GO TO 2500
2280 IF K2<15 THEN P=.2 \ GO TO 2500
2290 IF K2<20 THEN P=.3 \ GO TO 2500
2300 IF K2<25 THEN P=.4 \ GO TO 2500
2310 IF K2<30 THEN P=.5 \ GO TO 2500

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2330 IF K2<40 THEN P=.7 \ GO TO 2500
2340 IF K2<45 THEN P=.8 \ GO TO 2500
2350 IF K2<50 THEN P=.9 \ GO TO 2500
2360 IF K2=50 THEN P=1 \ GO TO 2500
2370 IF K2<56 THEN P=.9 \ GO TO 2500
2380 IF K2<61 THEN P=.8 \ GO TO 2500
2390 IF K2<66 THEN P=.7 \ GO TO 2500
2400 IF K2<71 THEN P=.6 \ GO TO 2500
2410 IF K2<76 THEN P=.5 \ GO TO 2500
2420 IF K2<80 THEN P=.4 \ GO TO 2500
2430 IF K2<86 THEN P=.3 \ GO TO 2500
2440 IF K2<91 THEN P=.2 \ GO TO 2500
2450 P=.1 \ GO TO 2500
2460 IF N2$="F" THEN P=.2 \ GO TO 2500
2470 IF N2$="A" THEN P=.2 \ GO TO 2500
2480 IF N2$="C" THEN P=.9 \ GO TO 2500
2490 F(7)=1 \ G(7)=1
2500 Z=POS(J4$,"Z",1)
2510 IF Z>0 THEN 2730
2520 Z=POS(J4$,"-",1)
2530 IF Z>0 THEN 2730
2535 J4=VAL(J4$)
2540 IF J4<38 THEN C=.1 \ GO TO 2790
2550 IF J4<41 THEN C=.2 \ GO TO 2790
2560 IF J4<44 THEN C=.3 \ GO TO 2790
2570 IF J4<48 THEN C=.4 \ GO TO 2790
2580 IF J4<52 THEN C=.5 \ GO TO 2790
2590 IF J4<58 THEN C=.6 \ GO TO 2790
2600 IF J4<64 THEN C=.7 \ GO TO 2790
2610 IF J4<70 THEN C=.8 \ GO TO 2790
2620 IF J4<77 THEN C=.9 \ GO TO 2790
2630 IF J4<84 THEN C=1 \ GO TO 2790
2640 IF J4<91 THEN C=.9 \ GO TO 2790
2650 IF J4<96 THEN C=.8 \ GO TO 2790
2660 IF J4<101 THEN C=.7 \ GO TO 2790
2670 IF J4<106 THEN C=.6 \ GO TO 2790
2680 IF J4<109 THEN C=.5 \ GO TO 2790
2690 IF J4<113 THEN C=.4 \ GO TO 2790
2700 IF J4<117 THEN C=.3 \ GO TO 2790
2710 IF J4<121 THEN C=.2 \ GO TO 2790
2720 C=.1 \ GO TO 2790
2730 IF K4$="VU" THEN C=.1 \ GO TO 2790
2740 IF K4$="VS" THEN C=.1 \ GO TO 2790
2750 IF K4$="U" THEN C=.5 \ GO TO 2790
2760 IF K4$="S" THEN C=.5 \ GO TO 2790
2770 IF K4$="M" THEN C=1 \ GO TO 2790
2780 F(8)=1 \ G(8)=1
2790 IF A4$="A" THEN R=.9 \ GO TO 2830
2800 IF A4$="B" THEN R=.6 \ GO TO 2830
2810 IF A4$="C" THEN R=.3 \ GO TO 2830
2820 F(9)=1 \ G(9)=1
2830 Z=POS(L3$,"Z",1)
2840 IF Z>0 THEN F(10)=1 \ G(10)=1 \ GO TO 2950
2845 L3=VAL(L3$)
2850 IF L3<15 THEN V=.1 \ GO TO 2950
2860 IF L3<20 THEN V=.2 \ GO TO 2950
2870 IF L3<25 THEN V=.3 \ GO TO 2950
2880 IF L3<30 THEN V=.4 \ GO TO 2950
2890 IF L3<40 THEN V=.5 \ GO TO 2950
2900 IF L3<50 THEN V=.6 \ GO TO 2950
2910 IF L3<60 THEN V=.7 \ GO TO 2950
2920 IF L3<70 THEN V=.8 \ GO TO 2950
2930 IF L3<80 THEN V=.9 \ GO TO 2950
2940 V=1
2950 FOR M=1 TO 3 \ H(I,M)=1 \ NEXT M \ F=0

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2954 H(I,1)=H(I,1)*(((D1+W1+V1)/N)^1.5)
2956 H(I,2)=H(I,2)*(((D2+W2+V1)/N)^1.5)
2958 H(I,3)=H(I,3)*(((D3+W3+V2)/N)^1.5)
2959 E=E+1.5
2960 IF F(4)=1 THEN 2966
2962 H(I,1)=H(I,1)*(T1^,.9) \ H(I,2)=H(I,2)*(T2^,.9) \ H(I,3)=H(I,3)*(T3^,.9)
2964 E=E+.9
2966 IF F(5)=1 THEN 2972
2968 FOR M=1 TO 3 \ H(I,M)=H(I,M)*(S^,.8) \ NEXT M
2970 E=E+.8
2972 IF F(6)=1 THEN 2978
2974 FOR M=1 TO 3 \ H(I,M)=H(I,M)*(A^,.5) \ NEXT M
2976 E=E+.5
2978 IF F(7)=1 THEN 2984
2980 FOR M=1 TO 3 \ H(I,M)=H(I,M)*(P^,.9) \ NEXT M
2982 E=E+.9
2984 IF F(8)=1 THEN 2990
2986 FOR M=1 TO 3 \ H(I,M)=H(I,M)*(C^,.9) \ NEXT M
2988 E=E+.9
2990 IF F(9)=1 THEN 2996
2992 FOR M=1 TO 3 \ H(I,M)=H(I,M)*(R^,.5) \ NEXT M
2994 E=E+.5
2996 IF F(10)=1 THEN 3002
2998 FOR M=1 TO 3 \ H(I,M)=H(I,M)*(V^,.7) \ NEXT M
3000 E=E+.7
3002 FOR M=1 TO 10
3004 IF F(M)=0 THEN 3012
3006 NEXT M
3008 PRINT "ALL DATA FOR HSI CALCULATION ON REACH";I;"MISSING"
3010 FOR M=1 TO 3 \ H(I,M)=99 \ NEXT M \ GO TO 3014
3012 FOR M=1 TO 3 \ H(I,M)=H(I,M)^(1/E) \ NEXT M
3014 IF END #1 THEN PRINT "END" \ GO TO 3060
3016 INPUT #1;Y$
3020 IF SEG$(Y$,1,1)="5" THEN 3014
3030 IF SEG$(Y$,1,1)="2" THEN 181
3040 IF SEG$(Y$,1,1)<>"1" THEN PRINT "CARD # NOT EXPECTED";Y$ \ GO TO 3014
3060 PRINT #2:"STREAM NAME : ";A1$; "      STREAM-MOUTH-LOC : ";C1$;
3070 PRINT #2:"      SURVEY DATE : ";SEG$(C9$,1,2);"/";SEG$(C9$,3,4);"/";SEG$(C9$,5,6)
3080 PRINT #2:"STREAM LENGTH : ";D1$; "      LENGTH NOT SURVEYED : ";L
3085 PRINT #2:
3090 L1=0 \ FOR M=1 TO I \ L1=L1+L(M) \ NEXT M
3100 IF L1<(VAL(D1$)-.01) THEN 3110
3102 IF L1>(VAL(D1$)+.01) THEN 3110
3104 GO TO 3120
3110 PRINT #2:"***** ERROR MESSAGE : STREAM LENGTH = ";D1$; "      TOTAL OF REACH
LENGTHS = ";L1$; "      *****"
3120 IF H(1,1)<>99 GO TO 3140
3130 H(1,1)=H(2,1) \ H(1,2)=H(2,2) \ H(1,3)=H(2,3)
3140 FOR M=2 TO I
3150 IF H(M,1)=99 THEN H(M,1)=H(M-1,1) \ H(M,2)=H(M-1,2) \ H(M,3)=H(M-1,3)
3152 NEXT M
3153 W9=99
3154 FOR M=1 TO I
3156 IF W(M)<W9 THEN W9=W(M)
3158 NEXT M
3160 IF W9=99 THEN W9=0
3162 FOR M=1 TO I
3164 IF W(M)=99 THEN W(M)=W9
3166 NEXT M
3168 H1=0 \ H2=0 \ H3=0 \ I8=0
3170 FOR M=1 TO I
3172 A8=L(M)*W(M)*640/5280
3175 PRINT #2;USING P9$,N(M),L(M),W(M),A8,H(M,1),H(M,2),H(M,3)
3176 IF N(M)<>M THEN I8=1

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3190 H2=H2+H(M,2)*L(M)
3200 H3=H3+H(M,3)*L(M)
3210 NEXT M
3211 IF I8=0 THEN 3220
3212 PRINT #2:"***** ERROR MESSAGE : CHECK HSI VALUES FOR ENTIRE STREAM BECAU
REACH NUMBERS ENTERED OUT OF SEQUENCE *****"
3220 H1=H1/L1 \ H2=H2/L1 \ H3=H3/L1
3230 PRINT #2:USING "HSI ANADROMOUS HARVEST SPECIES : ,##",H1
3240 PRINT #2:USING "HSI ANADROMOUS EMPHASIS SPECIES : ,##",H2
3250 PRINT #2:USING "HSI RESIDENT TROUT SPECIES : ,##",H3
3260 PRINT #2:USING "HSI REDBAND TROUT SPECIES : ,##",H3
3280 PRINT #2:"MISSING DATA : "
3290 IF G(1)=1 THEN PRINT #2:TAB(15);"DEPTH"
3300 IF G(2)=1 THEN PRINT #2:TAB(15);"WIDTH"
3310 IF G(3)=1 THEN PRINT #2:TAB(15);"VELOCITY"
3320 IF G(4)=1 THEN PRINT #2:TAB(15);"TEMP"
3330 IF G(5)=1 THEN PRINT #2:TAB(15);"% SHADE"
3340 IF G(6)=1 THEN PRINT #2:TAB(15);"A.F.O."
3350 IF G(7)=1 THEN PRINT #2:TAB(15);"%POOL"
3360 IF G(8)=1 THEN PRINT #2:TAB(15);"CH STAB"
3370 IF G(9)=1 THEN PRINT #2:TAB(15);"POOL GD"
3380 IF G(10)=1 THEN PRINT #2:TAB(15);"S.S.A."
3390 FOR M=1 TO 10
3400 IF G(M)=1 THEN 3430
3410 NEXT M
3420 PRINT #2:TAB(15);"NONE"
3430 PRINT #2:
3438 A9=0
3440 FOR M=1 TO I \ A9=A9+L(M)*W(M) \ NEXT M
3450 PRINT #2:"TOTAL LENGTH = ";L1;" MILES"; AREA = ";A9*640/3280;" ACRES
3452 A6=A6+A9 \ L6=L6+L1
3455 A8=0 \ L8=0
3460 FOR M=1 TO I
3470 IF B$(M)="B" THEN 3520
3480 A8=A8+L(M)*W(M) \ L8=L8+L(M)
3500 NEXT M
3510 GO TO 3540
3520 A8=A8+L(M)*W(M)*.5
3530 L8=L8+L(M)*.5
3540 PRINT #2:"UNBLOCKED LENGTH = ";L8;" MILES UNBLOCKED AREA = ";A8*640/5
0;" ACRES"
3550 PRINT #2:X$
3600 IF END #1 THEN 4000
3610 GO TO 132
4000 FOR M=1 TO 5 \ PRINT #2: \ NEXT M
4010 PRINT #2:X$
4020 PRINT #2:"TOTAL LENGTH OF ALL STREAMS IN FILE = ";L6;" MILES"; TOTAL
REA = ";A6*640/5280;" ACRES"
4025 PRINT #2:X$
4030 CLOSE
4040 END

```

```

10 REM PROGRAM TO LIST FISH DATA
11 X$="*" \ FOR M=1 TO 130 \ X$=X$&"*" \ NEXT M
20 OPEN "LP:" FOR OUTPUT AS FILE #2
30 PRINT "ENTER NAME OF FILE THAT FISH DATA IS STORED"
40 INPUT Z$
50 OPEN Z$ FOR INPUT AS FILE #1
52 PRINT #2:X$
54 PRINT #2:"F I L E      N A M E : ";Z$
56 PRINT #2:X$
60 IF END #1 THEN PRINT "END OF FILE" \ GO TO 600
65 PRINT #2:
70 LINPUT #1:Y$
71 IF SEG$(Y$,1,1)<>"1" GO TO 75
72 PRINT #2:X$
75 PRINT #2:"CARD      *2*STREAM NAME";
80 IF SEG$(Y$,1,1)<>"1" GO TO 130
90 PRINT #2:"      *1*STREAM CODE      *3*MOUTH      *32*LENGTH"
100 PRINT #2:" 1      ";SEG$(Y$,2,15);"      ";SEG$(Y$,18,30);"      ";
110 PRINT #2:SEG$(Y$,31,38);"      ";SEG$(Y$,39,42)
120 GO TO 60
130 IF SEG$(Y$,1,1)<>"2" GO TO 240
140 PRINT #2:"      *4*      *6*      *51*      *61*      *62*      *7*      *8*      *9*";
150 PRINT #2:"      *10*      *111*      *211*      *311*      *112*      *212*      *312*      *13*";
160 PRINT #2:" 2      ";SEG$(Y$,2,15);"      ";SEG$(Y$,16,17);"      ";SEG$(Y$,18,19);
170 PRINT #2:"/";SEG$(Y$,20,21);"/";SEG$(Y$,22,23);"      ";SEG$(Y$,24,27);
180 PRINT #2:"      ";SEG$(Y$,28,32);"      ";SEG$(Y$,33,35);"      ";SEG$(Y$,36,39);
190 PRINT #2:"      ";SEG$(Y$,40,41);"      ";SEG$(Y$,42,44);"      ";SEG$(Y$,45,45);
200 PRINT #2:"      ";SEG$(Y$,46,48);"      ";SEG$(Y$,49,51);"      ";SEG$(Y$,52,54);
210 PRINT #2:"      ";SEG$(Y$,55,55);"      ";SEG$(Y$,56,56);"      ";
220 PRINT #2:SEG$(Y$,57,57);"      ";SEG$(Y$,58,58)
230 GO TO 60
240 IF SEG$(Y$,1,1)<>"3" GO TO 360
250 PRINT #2:"      *4*      *6*      *114*      *214*      *314*      *414*      *514*      *614*      *714*";
260 PRINT #2:"      *116*      *216*      *316*      *416*      *516*      *616*      *716*";
270 PRINT #2:" 3      ";SEG$(Y$,2,15);"      ";SEG$(Y$,16,17);"      ";SEG$(Y$,18,19);
290 PRINT #2:"/";SEG$(Y$,20,21);"/";SEG$(Y$,22,23);"      ";SEG$(Y$,24,26);"      ";
300 PRINT #2:SEG$(Y$,27,29);"      ";SEG$(Y$,30,32);"      ";SEG$(Y$,33,35);"      ";
310 PRINT #2:SEG$(Y$,36,38);"      ";SEG$(Y$,39,41);"      ";SEG$(Y$,42,44);"      ";
320 PRINT #2:SEG$(Y$,45,47);"      ";SEG$(Y$,48,50);"      ";SEG$(Y$,51,53);"      ";
330 PRINT #2:SEG$(Y$,54,56);"      ";SEG$(Y$,57,59);"      ";SEG$(Y$,60,62);"      ";
340 PRINT #2:SEG$(Y$,63,65)
350 GO TO 60
360 IF SEG$(Y$,1,1)<>"4" GO TO 460
370 PRINT #2:"      *4*      *6*      *15*      *17*      *18*      *180*      *181*      *19*      *20*";
380 PRINT #2:"      *21*      *22*      *23*      *24*      *250*";
390 PRINT #2:" 4      ";SEG$(Y$,2,15);"      ";SEG$(Y$,16,17);"      ";SEG$(Y$,18,19);
400 PRINT #2:"/";SEG$(Y$,20,21);"/";SEG$(Y$,22,23);"      ";SEG$(Y$,24,24);
410 PRINT #2:"      ";SEG$(Y$,25,25);"      ";SEG$(Y$,26,27);"      ";
420 PRINT #2:SEG$(Y$,28,28);"      ";SEG$(Y$,29,34);"      ";SEG$(Y$,35,37);"      ";
430 PRINT #2:SEG$(Y$,38,38);"      ";SEG$(Y$,39,39);"      ";SEG$(Y$,40,42);
440 PRINT #2:"      ";SEG$(Y$,43,45);"      ";SEG$(Y$,46,47);"      ";SEG$(Y$,48,48)
450 GO TO 60
460 IF SEG$(Y$,1,1)<>"5" GO TO 530
470 PRINT #2:"      *4*      *6*      *125*      *225*      *325*      *425*";
480 PRINT #2:" 5      ";SEG$(Y$,2,15);"      ";SEG$(Y$,16,17);"      ";SEG$(Y$,18,19);
490 PRINT #2:"/";SEG$(Y$,20,21);"/";SEG$(Y$,22,23);"      ";SEG$(Y$,24,28);
500 PRINT #2:"      ";SEG$(Y$,29,34);"      ";SEG$(Y$,35,35);"      ";
510 PRINT #2:SEG$(Y$,36,36)
520 GO TO 60
530 PRINT #2:" BAD CARD CODE : ";SEG$(Y$,1,1)
540 PRINT #2:Y$
550 GO TO 60
600 CLOSE
610 END

```